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Sandia and Los Alamos Devise Micro-Labs for Nano-Experiments

A new kind of laboratory, so small that a half dozen would fit on your fingernail, promises to accelerate the exploration and exploitation of new generations of nanomaterials. These "Discovery Platforms™" are basically micro-electromechanical (MEMS) systems-on-a-chip. Each chip measures about 5mm on a side; each chip bristles with as many as 80 electrical contacts for collecting and transmitting experimental data; and each chip is specialized for the exploration of a particular set of phenomena in the nano-domain, ranging from nanoelectronics/nanophotonics to nano-mechanics to nano-fluidics.

The Discovery Platforms are the brainchild of the Center for Integrated Nanotechnologies (CINT), a newly formed nanoscience research center funded by the Department of Energy Office of Basic Energy Sciences and jointly operated by Sandia National Laboratories and Los Alamos National Laboratory in New Mexico. Researchers from universities, government laboratories, and private companies will work with CINT's scientific staff to devise and use these micro-labs-on-chips to perform sophisticated experiments in the nano-domain.

Already, the response to CINT's new capabilities, including these Discovery Platforms, is encouraging. CINT's first call for proposals, even before its facilities were finished, attracted more than 250 proposals (of which it was able to support about 85). CINT's first call for proposals making use of its newly constructed facilities was issued in January 2006 and attracted 175 proposals (of which it was able to support more than 100). CINT's most recent call closed in early April 2007 and enjoyed a comparable response.

At this early stage, it is difficult to guess what new nanoscience phenomena will be uncovered, elucidated, and exploited. However, CINT projects already include topics as diverse as:

- Quantum-confined structures, such as quantum wires and quantum dots
- Artificially structured epitaxial materials
- Terahertz-frequency phenomena
- Nanometer-scale MEMS (or "NEMS")
- Interaction of phospholipids with photochemically patterned silane monolayers
- Polarization of electron spin at the nano-scale
- Fluid transport and percolation through nanomaterials
- Optical solitons
- Surface acoustic wave phenomena in two-dimensional electron systems
- Strength of nanostructured materials

The results of these projects have been or will be published in refereed journals as diverse as the *Journal of Applied Physics, Physical Review Letters, Journal of the American Chemical Society*, *Nature,* and *Science*.

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