

## I. Science & Technology for Interfacing to the Nanoscale

### (C) Interface Hierarchical Issues in 3-D Nanoarchitectures

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This session will focus on the potential of nanodevices for use in 3D integration. Here the major emphasis is on strategies for dimensional scaling of nanostructured assemblies, nanocircuits and architectures, and modeling and simulation leading to new sensors and system concepts. Important questions to be addressed include: what are the hierarchical considerations in such integration; and how well can one preserve the nano-properties in integration?

#### **Specific Areas of Emphasis:**

- Ø Directed-assembly-driven fabrication and processing instabilities (morphological, chemical and thermal) and their impact on properties of nanostructured assemblies.
- Ø Layer-by-layer processing and properties of 3D architectures using nanoscale building blocks and/or Strategies for dimensional scaling of nanostructured assemblies.
- Ø Nanocircuits and architectures
  - How to build nanosystems utilizing nanoelectronic devices based on new state variables (noncharge) based on phase transitions, spin or magnetization can require less energy per bit.
  - Nontraditional architectures that (a) enable new nanoelectronics technology in two- and three-dimensions, (b) that can take advantage of stochastic organization of molecular devices by reprogramming them or measuring the intrinsic circuits they compute, and (c) that enable a wide operating temperature range about room temperature.
- Ø Modeling and simulation leading to new architectures and device concepts.
  - Promising state-of-the-art ab-initio models into nanodevice and carrier transport simulations and improving the algorithmic efficiency of transport and device simulation by a factor of at least one order of magnitude.
  - Circuit simulation tools that include electro-thermal, soft and liquid state, interconnects, and nonlocal parameters.