NEW FRONTIERS IN NANOTECHNOLOGY

(1)

Context: National Nanotechnology Initiative is changing its priorities

ENG has had the leading role in NSF and NSF in NNI; PCAST/ Congress/ NRC evaluations: *Significant outcomes - in discovery, education, industry, society*

2006: *There is a transition from R&D on passive nanostructures and single components to active nanostructures and nanosystems*, with increased R&D challenges and focus on system architecture and integration with applications

Engineering has a special role because it deals better with of multidisciplinary projects, system approach, and transforming tools; Nano – integrator for ENG

Key research and education challenges with ENG leadership

- **Tools for measurement and restructuring of matter** - with atomic precision, time resolution of chemical reactions, and for domains of engineering relevance

- **Nanomanufacturing** - new body of manufacturing knowledge is needed to support the advances in nano and nano-bio science and engineering

- **Nanoelectronics** – beyond SN, non-charge and non-equilibrium based devices

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(2)

Other research and education challenges that need collaborations

- Q*uantum phenomena in nano/micro systems:* understanding and use
- *Selfassembling:* on multiple length and time scales
- *Nanobiotechnology:* understanding the cell, neuromorphic engineering, nano-interfaces between human body and human-made devices
- *Energy conversion:* new concept for direct conversion
- *Water filtration and desalination:* exploratory concepts
- *Nano-informatics:* to gather, manage, integrate and enable access to data

Need/Impact

Address key science and engineering barriers in nanotechnology development

NSF's role

Knowledge on nanostructures and nanosystems; infrastructure; earlier education

Partnerships

Opportunities in NSF; interagency (NNI); states; international; industry (CBAN)