



A New Government, Industry and University Partnership through Discovery Science and Engineering Innovation Institutes

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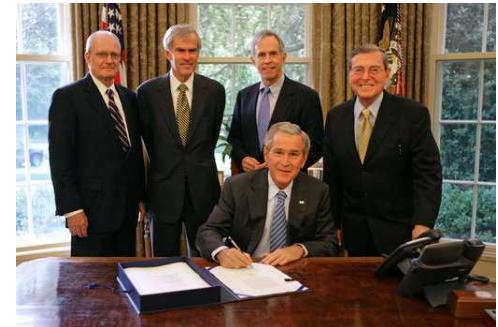
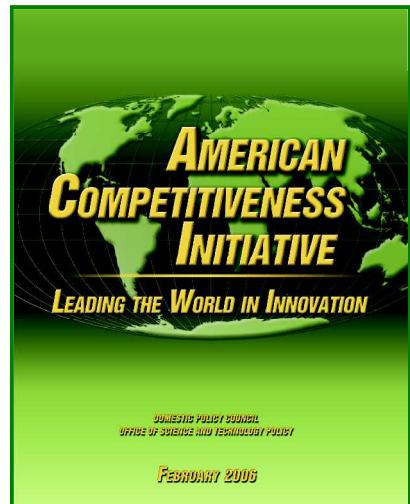
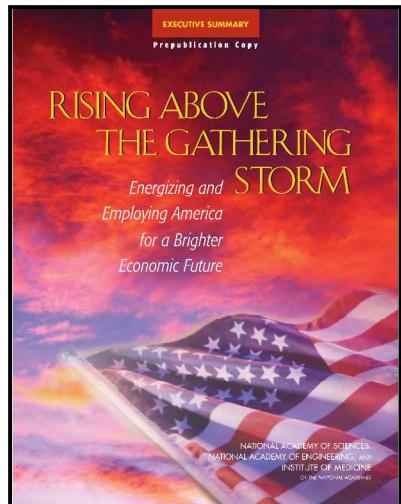


Discovery Science & Engineering
Innovation Institutes





Preparing the U.S. for the Future



**America COMPETES Act
enacted 8/9/2007**

Assuring U.S. innovation leadership in a time of increasing global competition:

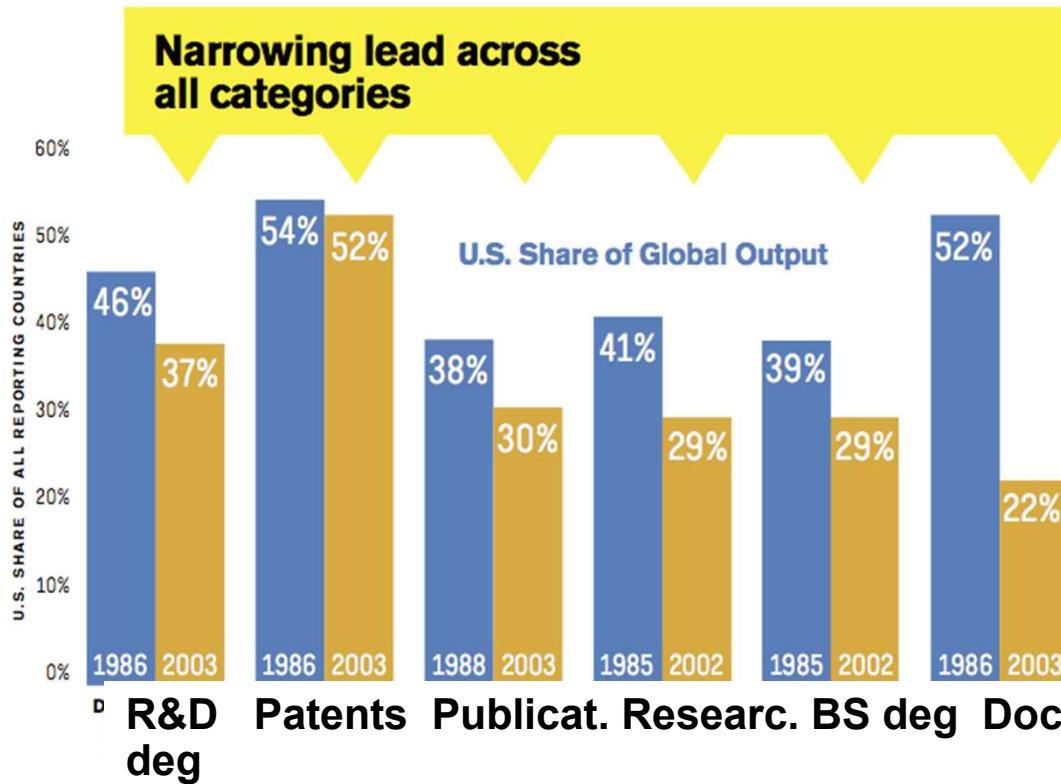
- Reduce the cycle time for innovation - partnerships
- Develop future talent – depth & breadth, diversity, rich experiences
- Fully capitalize on existing investments
- Address critical national issues





Time is Critical - the world is evolving rapidly

Important trends have increased the urgency for a new approach



59% of engineering Ph.D.s from US universities earned by foreign nationals

Industrial research labs no longer carry the innovation burden for the U.S.



EXON
Bell Laboratories





Learning from Others

If America wants to compete in a global economy we need to understand and learn from the global community.

Much is to be gained by understanding:

- Public/Private partnerships are becoming increasingly important mechanisms for accelerating and strengthening innovation around the world.
- European Union (and others) have many great examples of public/private partnerships – some are breaking new ground and thinking differently about partnerships
- What can we learn that will allow us to think differently about how the United States innovates and how we attract and inspire the next generation of top students into engineering and sciences.



Minatech Grenoble, France



IMEC Lueven, Belgium



MESA+ Enschede, Netherlands



Karlsruhe Institute of Technology, Germany

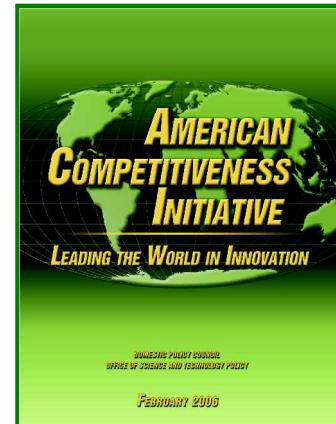
Examples of Public/Private Partnerships in Europe



The nation is developing an aggressive plan

"In partnership with the private sector, State and local governments, and colleges and universities, the American Competitiveness Initiative will promote new levels of educational achievement and economic productivity."

**GEORGE W. BUSH, STATE OF THE UNION ADDRESS,
2/2/2006**



America COMPETES Act signed into law August, 9th, 2007

- ✓ Discovery Science & Engineering Innovation Institutes included as a provision for DOE.



Next step is appropriations.



DOE is in a position to “Change the Game”

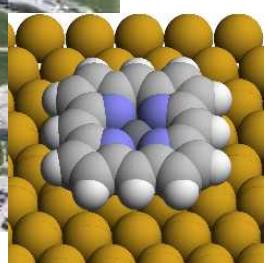
Assuring a sustainable energy future



Ensuring National Security



Nurturing the nation's S&T base



- **Important national missions**
- **Unique national facilities around the country**
- **>21,000 DOE scientists & engineers**
- **The largest supporter of physical science research**





A vision for the next decade: Partnering for workforce development & innovation

Discovery Science & Engineering Innovation Institutes

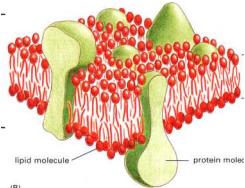
Young, diverse talent



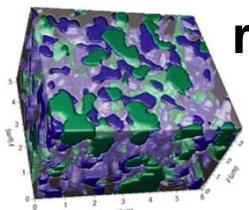
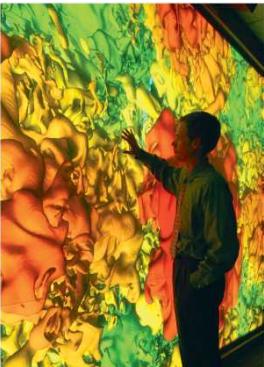
Transformed education



Broad collaborations



Compelling national research



State-of-the-art facilities



Lab & industry mentoring

OUTCOMES

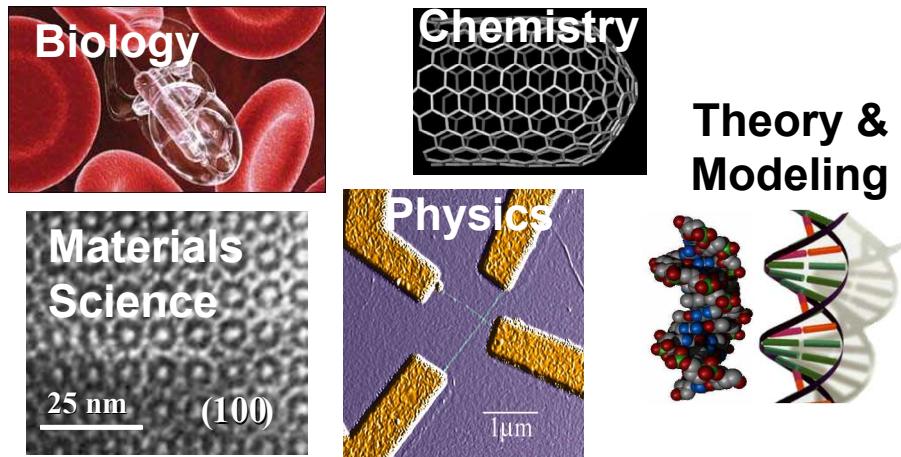
- Future science & engineering leaders
- New breakthroughs
- Outreach & expanded partnerships
- Enhanced lab vitality
- Enhanced economic competitiveness





Prototyping the Innovation Institute Concept: *National Institute for Nano-Engineering*

Nano-engineering will be a critical competitive hinge for the U.S.



- New electronics
- Sensors
- Catalysts
- High-performance materials
- Energy storage
- Optics
-

NINE Mission: Help develop the next generation of engineering leaders needed to drive future innovations in micro- and nano-technology





NINE is a nationwide network of partners...

... who are joining together to support innovation, workforce development and economic competitiveness in Nano-Engineering.



NINE is actively recruiting additional partners





NINE builds on Sandia's strong science & technology infrastructure

Workforce Development & Innovation Partnerships

Center for Integrated Nanotechnologies



Discovery science & user support



Office of Basic Energy Sciences



High performance computing



Platforms & codes

"Sandia's facilities are unique in combination and provide the ability to produce prototype nano-micro technology systems involving multiple facilities and capabilities, a difficult opportunity for universities to provide their students." – David Duquette, RPI and Kevin Jones, Univ. of Florida.

Microsystems & Engineering Sciences Applications



Technology development & product realization



A Vision For The Next Decade: Research Partnerships that provide opportunities for students & innovation

NINE is designed to meet all partners needs:

■ **Sandia, DOE, and the nation**

- Innovative nano-engineering solutions to difficult national security problems: energy, defense, energy, economic security. Future workforce.

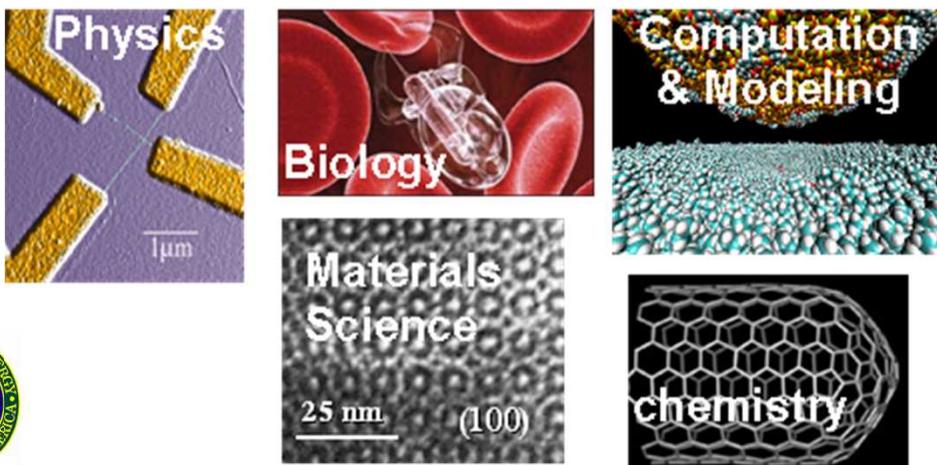
■ **Universities, their students and faculty**

- Exciting large scale nano-engineering research opportunities for students and faculty, access to top facilities and ownership of the IP

■ **U.S. industry**

- Financial leverage for innovative pre-competitive nano-engineering research, Intellectual Property in key areas, access to vetted new hires

Focusing on Multi-disciplinary Nano-Engineering



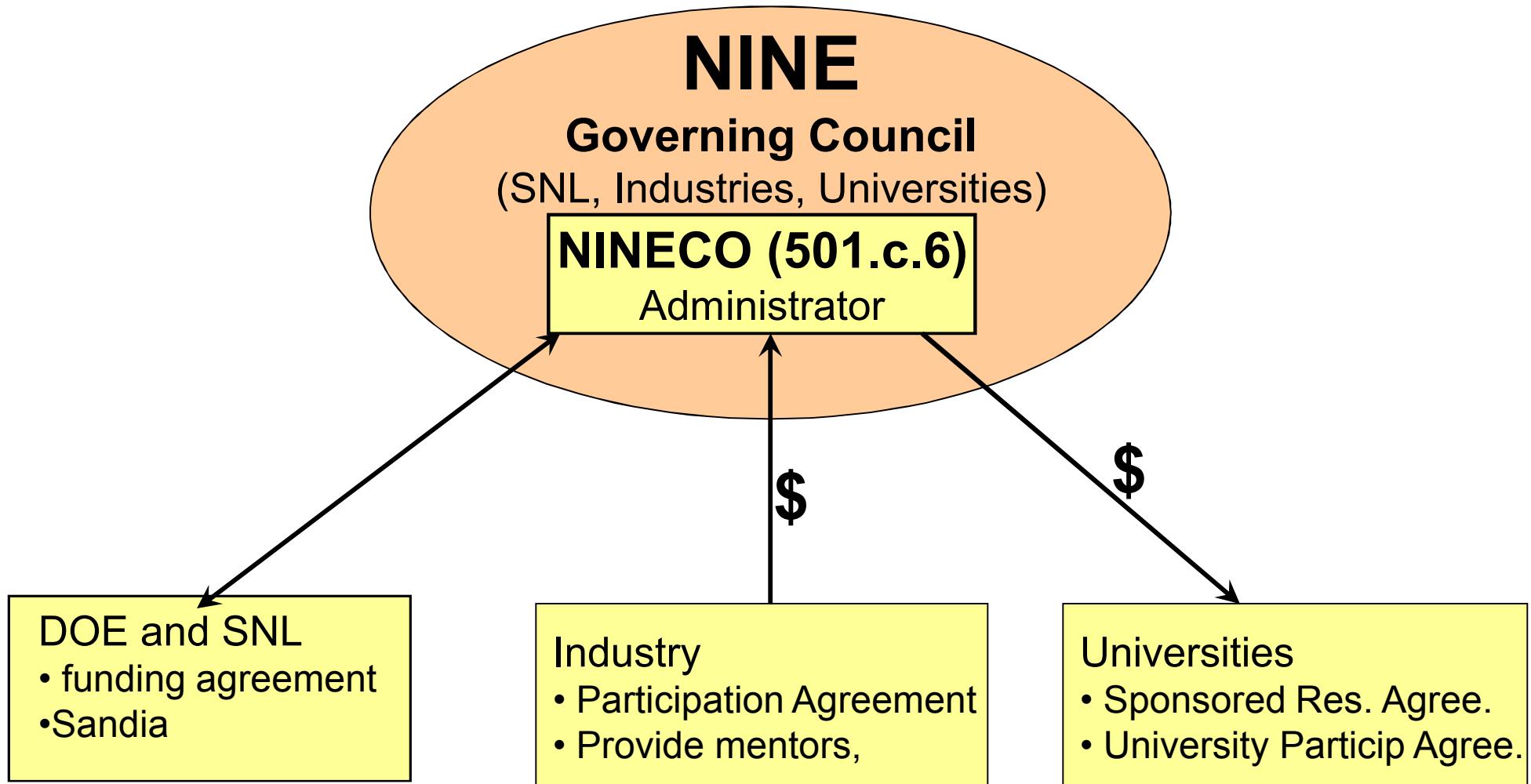
Competitive hinge for:

- Next-generation electronics
- Energy conversion materials
- Low power sensors, real envir
- Catalysts for synthesis
- Photonics, plasmonics
- Energy storage
- ...





NINE's Structure & Agreements





NINE's Technical Focus Areas for FY09

Areas - Leading Industry Proponents

- Atomic Layer Control, Nano Patterning, and Scalable Directed Self-Assembly for IT, Photonics & Large Area Nano Manufacturing – IBM, L-M, and Corning
- Nano-Engineered Chemical Processing – E-M, Goodyear, IBM
- Synthesis and Modeling of Active Nano-Composites and Smart Materials – Goodyear, L-M, Corning
- Nano-Enabled, Low Cost, Self-Powering Sensors for Extreme Environments – E-M, L-M, Monsanto





2008 NINE Summer Program

A spectrum of opportunities for students

- 42 students from 22 universities were touched by the NINE program
- 33 (80% grad students) did nano-engineering research with mentors in 10 Sandia Centers and one industry site
- 3 NINE Industry Interns, 6 NSF interns, 4 NNSA interns, 6 Expo students
- Also one-day opportunities for USAF cadets & NSF-sponsored students (12)
- Summer Program offers hands-on activities and experiences
 - Tours of world-leading technical facilities
 - Lab experiences – Making & measuring Nanoparticles, work with AFM and TEM
 - Training and practice in effective communications
 - Presentations and lab tours from other NINE students
 - Seminars in business, accounting, Intellectual Property, Innovation, Nanotech Markets, Ethics and Social Issues in Nanotechnology
 - NINE Student Workshop – presentations by students on their research
 - Nanofest: Nano-engineering and our Global Energy Future
- Also helped with NSF/UNM/Academy Nano-camp (27 students, 12 teachers)
- NINE Technology Workshop – 70 researchers from Gov/Univ/Industry determined the technical focus for 2009 NINE projects





Summary and Needs

Summary

- 1) NINE is operational, pioneering effective partnership approaches
- 2) Expanding this approach to other labs
- 3) Discovery Innovation Institutes will have a national impact

What is needed?

Fund Discovery Science & Engineering Innovation Institutes as authorized in the America COMPETES Act





- Back up slides





NINE: A prototype model for Discovery Science & Engineering Innovation Institutes

Discovery Science & Engineering Innovation Institutes: A new DOE – Academic – Industry research partnership for science & engineering education, workforce development and innovation partnerships

Discovery Science & Engineering Innovation Institutes – authorized by America COMPETES Act (August, 2007)

- (a) The Secretary (of DOE) shall establish** multidisciplinary institutes centered at National Laboratories to apply fundamental science and engineering discoveries to technological innovations related to the missions of the Department and the global competitiveness of the United States.
- (c) The Secretary shall establish partnerships between the Institutes and--**
 - institutions of higher learning train undergraduate and graduate engineering and science students;
 - private industry to develop innovative technologies
 - state and local governments to promote regionally-based commercialization and entrepreneurship;
- (e) Not more than 3 Institutes shall receive grants for a fiscal year.**
- (g) There is \$10,000,000 authorized to be appropriated to carry out the activities of each Institute selected for each of fiscal years 2008 through 2011.**

