

# The Fifth Assessment of the National Nanotechnology Initiative

PCAST Meeting  
Friday, July 11, 2014

# PCAST Members & Working Group

## PCAST

- **Michael McQuade** (co-chair)
- **Mark Gorenberg** (co-chair)
- **Maxine Savitz**
- **Bill Press**

## PCAST staff

- **Ashley Predith**
- **Marjory Blumenthal**

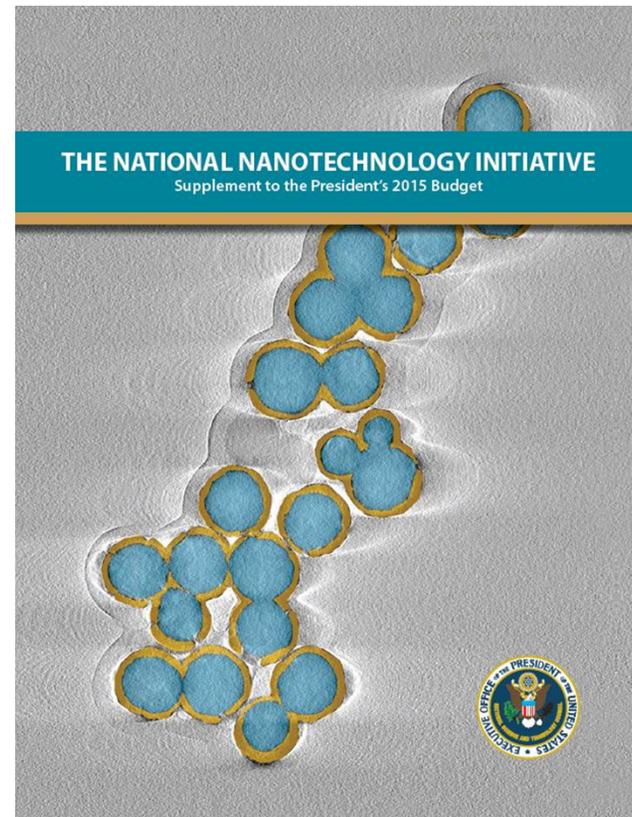
## Working Group

- **Paul McEuen**, Cornell
- **Paul Alivisatos**, UC-Berkeley/LBNL
- **Julia Phillips**, Sandia
- **William Kohlbrenner**, Abbvie
- **Omkaram Nalamasu**, Applied Materials
- **Andre Nel**, UCLA
- **Yet-Ming Chiang**, MIT
- **Joe DeSimone**, UNC, Chapel Hill
- **John Kelly**, IBM
- **Julia Lane**, American Institutes for Research
- **Josh Wolfe**, Lux

# National Nanotechnology Initiative (NNI)

*“a future in which  
the ability to understand and control matter at the nanoscale leads to  
a revolution in technology and industry that benefits society.”*

- Successful investment by the Federal government since 2001.
- FY2014 estimated Federal government investment \$1.5B
- [www.nano.gov](http://www.nano.gov)



# International Context (2012)

## Worldwide

- Investment by governments, corporations, and private investors = ***\$18.5 B***
- Worldwide nano-enabled product revenue = ***\$731 B***

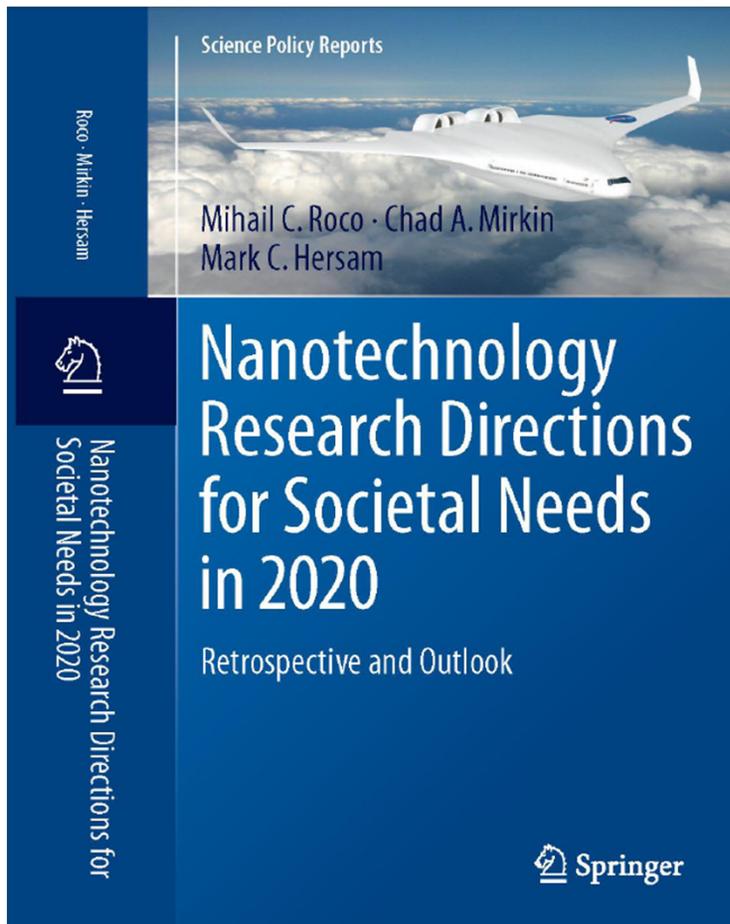
## Government spending

- US Federal and State = ***\$2.1 B***
- Europe = ***\$2.0 B***

## Corporate spending

- US = ***\$4.1 B***
- Japan = ***\$2.9 B***

# NNI 2.0 Transition Point



- Research moves from individual nanoscale building blocks to complex, simultaneous processes in nanosystems.
- Transition from improving existing products to engineering revolutionary new products
- Increasing applications in nanobiotechnology, energy resources, food and agriculture, simulation, and cognitive technologies.

# Directions

- **Nanotechnology Ecosystem** – a community of research, industrial, government, public, and philanthropic partners working with strategic plans toward the NNI vision
- **Grand Challenges**
  - Audacious, achievable, and inspirational goals with clear technical endpoints.
  - Cross-sector involvement in the selection, refinement, and pursuit of the goals.

# Illustrative Grand Challenges

## *Nano-enabled Desalination of Seawater to Solve the Emerging Water Crisis*

Novel nanostructured membranes with precisely controlled pore shapes. They could have very high selectivity in separating out salt from sea water at lower energy cost than existing methods.

## *Nano-based Antibacterials that Eradicate Untreatable Infections by 2025*

Using nanomaterials to disrupt the cell walls of bacteria, thus overcoming bacterias' ability to genetically evolve in response to new drugs.

# Illustrative Grand Challenges

## *Reducing Global Greenhouse Emissions with Nano-enabled Solid State Refrigeration*

Power production for building HVAC systems contributes to large amounts of GHG's.

Nanostructured thermoelectric materials could enable much more efficient heating and cooling systems.

# Commercialization & Nanomanufacturing



[www.internano.org](http://www.internano.org)



[www.internano.org/nmsummit/](http://www.internano.org/nmsummit/)



[www.techconnectworld.com/Nanotech2014/](http://www.techconnectworld.com/Nanotech2014/)

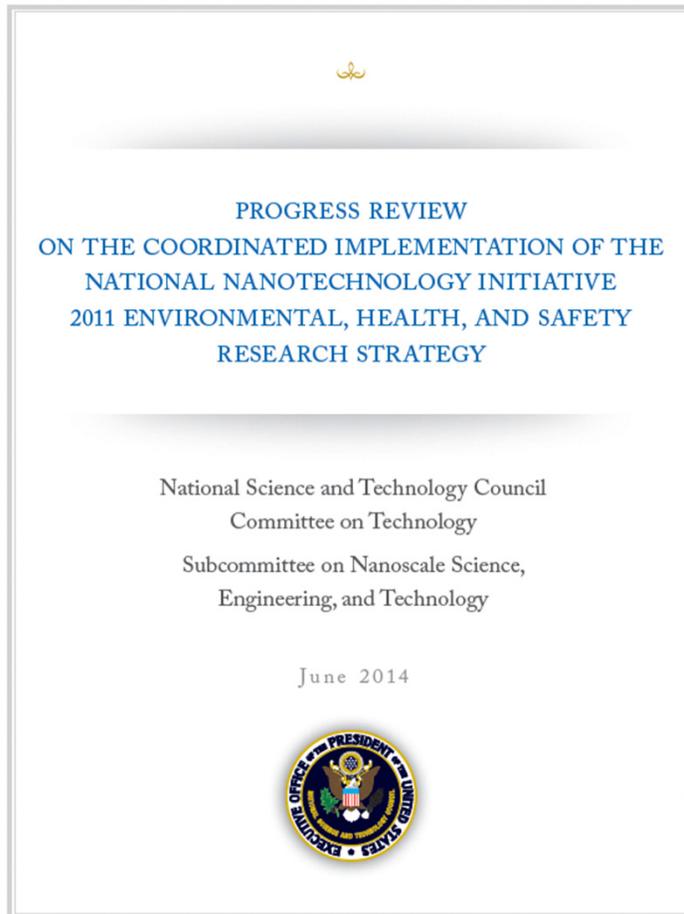


[www.nanobca.org](http://www.nanobca.org)

National Network for Manufacturing Innovation

[www.manufacturing.gov](http://www.manufacturing.gov)

# Environmental, Health, and Safety Issues



## Nanotechnology Environmental and Health Implications (NEHI) Working Group

Six core areas of the 2011 EHS Research Strategy

- Nanomaterial Measurement Infrastructure
- Human Exposure Assessment
- Human Health
- Environment
- Risk Assessment and Risk Management Methods
- Informatics and Modeling

# Environmental, Health, and Safety Issues

## Implementation of 2011 EHS Research Strategy (June 2014)

1. Development of comprehensive measurement tools that consider the full life cycles of engineered nanomaterials (ENMs) in various media.
2. Collection of exposure assessment data and resources to inform workplace exposure control strategies for key classes of ENMs.
3. Enhanced understanding of the modes of interaction between ENMs and physiological systems relevant to human biology.
4. Improved assessment of transport and transformations of ENMs in various environmental media, biological systems, and over full life cycles.
5. Development of principles for establishing robust risk assessment and risk management practices for ENMs and nanotechnology-enabled products that incorporate ENMs, as well as approaches for identifying, characterizing, and communicating risks to all stakeholders.
6. Coordination of efforts to enhance data quality, modeling, and simulation capabilities for nanotechnology, towards building a collaborative nanoinformatics infrastructure.

# NNCO Director Search

## The NNCO Director

- oversees all aspects of the National Nanotechnology Coordination Office, providing executive and technical leadership, management, and oversight of the NNCO staff in order to meet the NNCO mission
- leads communication and coordination on NNI issues among and between Federal agencies and external stakeholders
- serves as a national spokesperson for the NNI
- advises senior OSTP staff on nanotechnology R&D, regulation, and commercialization.

<http://www.nano.gov/node/1131>

# National Nanotechnology Coordination Office (NNCO)

- acts as the primary point of contact for information on the NNI;
- provides technical and administrative support to the Initiative, including the preparation of multiagency planning, budget, and assessment documents;
- develops, updates, and maintains the NNI website [www.nano.gov](http://www.nano.gov); and
- provides public outreach on behalf of the NNI

<http://www.nano.gov/node/1131>

# **BACKGROUND**

# Statement of Task

*Define the **role of government** that will position the US to be the leader in commercial products, research, and workforce in nanotechnology in 15 years.*

**GROWTH** - The National Nanotechnology Initiative performed an excellent role bringing nanotechnology from its emergence in the US through its first 13 years.

**TRANSLATION** – Research in science and engineering at the nanoscale is maturing. Government may need to take a new approach to ensure discovery translates into technology at scale.

**NNI REVIEW** - The review of NNI will proceed by evaluating the factors and systems needed to achieve leadership in 15 years.