2012 Regional, State, and Local Initiatives in Nanotechnology Workshop

Panel Session:
Federal Resources for Initiative Programs

Panelists:

Sandra Chapman, NIH / National Cancer Institute

Chris Cannizarro, Department of State

Khershed Cooper, Department of Defense

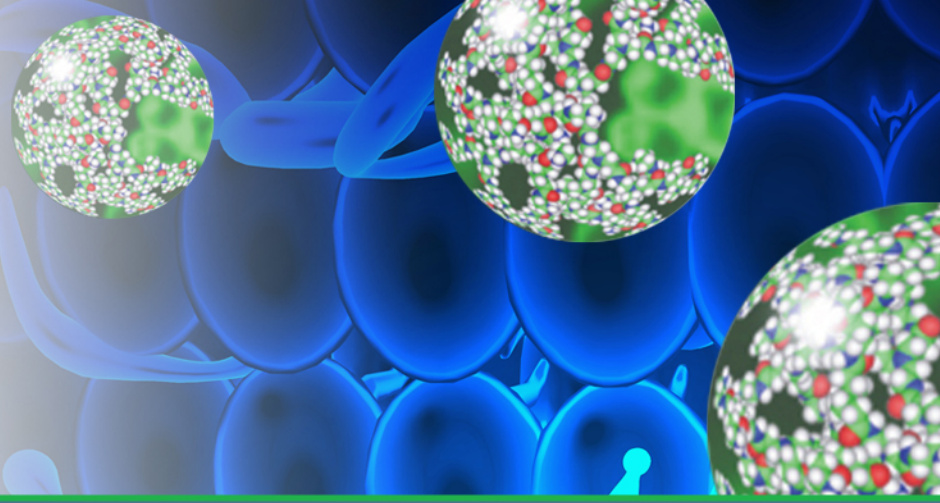
Ben Schrag, National Science Foundation

Altaf Carim, Department of Energy

David Porter, Economic Development Administration

National Cancer Institute

NCI Alliance for Nanotechnology in Cancer



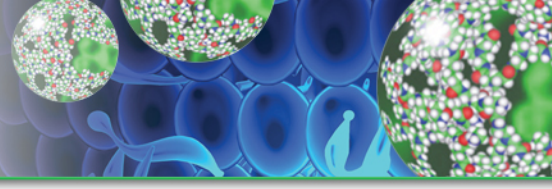
NCI Alliance for Nanotechnology in Cancer

Sandra Chapman
sandra.chapman@nih.gov

Office of Cancer Nanotechnology Research, NCI

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
National Institutes of Health

Nanotechnology Research at NIH



National Human Genome Research Institute

NHGRI

Advanced Nano-based Sequencing Technologies

Nanopores, micro-fluidics, etc.

NCI

Cancer Detection, Imaging, Therapy and Prevention

Diagnostics, Drug Delivery, Multiplexing, etc.

National Cancer Institute

National Heart Lung and Blood Institute

Heart, Lung and Blood Diseases

Targeted Therapies, Tissue Engineering, Biosensors, Diagnostics

- *National Nanotechnology Initiative*
- *Nanomedicine Roadmap*
- *NIH Nanotechnology Task Force*
- *IC Centers/Networks*

NIEHS

Addressing Health and Safety issues

Monitoring Tools

National Institute of Env. and Health Safety

NIGMS

Single Molecule Nanoscience Program

Medicinal Chemistry

National Institute of General Medical Sciences

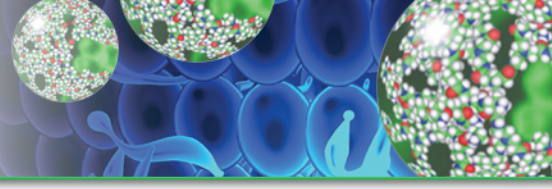
NIBIB

Enabling Nanotechnologies for Imaging and Diagnostics

Sensors, Nanoscale Patterning

National Institute of Biomedical Imaging and Bioengineering

NCI Alliance for Nanotechnology in Cancer Achievement



Centers for Cancer Nanotechnology Excellence (CCNE)

Cancer Nanotechnology Platform Partnerships

Multi-disciplinary Training Awards

Nanotechnology Characterization Laboratory

- **Scientific output** – over 1300 peer-reviewed journal papers published with average impact factor ~7
- **Clinical translation** – ~80 companies associated with the program in the space of diagnostics and therapy; 34 were formed in last 4 years. Developing strong intellectual property portfolio – over 200 disclosures and patents filed
  - several clinical trials are associated with program projects
  - several companies are in pre-IND discussions with FDA
  - Public-Private Partnership- TONIC
- **Leveraged funding** – investigators received numerous additional grants from peer-reviewed government sources, philanthropy, industry, and venture investors.

Phase I: 2005 – 2010
Phase II: 2010 - 2015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Initiatives in Nanotechnology

Global Issues in Nanotechnology

Chris Cannizzaro, PhD

Office of Space and Advanced Technology (OES/SAT)
U.S. Department of State

CannizzaroCM@state.gov

Office of Space and Advanced Technology

- Promote U.S. leadership
- Advance U.S. foreign policy, economic and national security interests
- Promote transparency and predictability
- Maximize utility of different systems through political and technical coordination
- Maintain fair trade and market-based competition through policy discussions on international and national regulatory regimes

Venues for Nanotechnology Cooperation

- Nanoscale Science, Engineering, and Technology (NSET) subcommittee of OSTP committee on technology
- NSET working groups:
  - **Global Issues in Nanotechnology (GIN)***
  - Nanotechnology Environmental and Health Implications (NEHI)
  - Nanomanufacturing Industry Liaison and Innovation (NILI)
  - Nanotechnology Public Engagement and Communication (NPEC)
- Organization for Economic Cooperation and Development (OECD) Nanotechnology Initiatives:
  - Working Party on Nanotechnology (WPN)*
  - Working Party on Manufactured Nanomaterials (WPMN)
- International Standards Organization Technical Committee on Nanotechnologies (ISO TC/229)
- Strategic Approach to International Chemicals Management (UNEP/SAICM)*

Those with State lead/chair/co-chair have asterisk (*)


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Initiatives in Nanotechnology

Defense Nanotechnology

POCs

- ✓ Lewis Sloter (OSD)
- ✓ Khershed Cooper (NRL/ONR)
- ✓ Akbar Khan (DTRA)
- ✓ Carole LeBlanc (OSD)
- ✓ Gernot Pomrenke (AFOSR/AFRL)
- ✓ David Stepp (ARO/ARL)

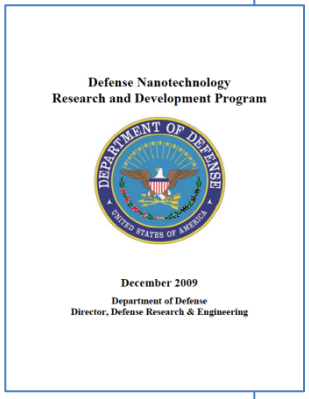
Panel Session: Federal Resources for Initiative Programs

2012 Regional, State and Local (RSL) Initiatives in Nanotechnology Workshop, Portland, OR, 1-2 May 2012

DoD Nanotechnology

Participation in NNI

- Founding Agency:
  - *Interagency cooperation*
  - *Contribute to Strategic Plan/Supplement*
  - *Respond to data calls/requests for information*
    - *DoD Nanotechnology R&D Program, Report to Congress, December 2009*
- NSET: *Co-chair, Lew Sloter, Office of Assistant Secretary of Defense for R&E*
- Signature Initiatives:
  - *Sustainable Nanomanufacturing*
  - *Nanoelectronics 2020*
- Working Groups:
  - *NILI*
  - *NPEC*
  - *GIN*
- PCAST Response:
  - *Increase investment in nanomanufacturing*


Defense Nanotechnology
Research and Development Program

December 2009

Department of Defense
Director, Defense Research & Engineering

Research and Development

- Scientific Merit
  - *Understand and control of matter at nano-scale*
- Relevance
  - *Enhance soldier and weapon systems capabilities*
- Nanotechnology view
  - *Enabling technology*
- Appropriations specifically for nanotechnology
  - *None*
- Investment balance
  - *50% basic research*

Foundational Programs

- Core and MURI (TRL 1)
- Applied research (TRL 2-3)
- Advanced technology development (TRL 4-6)
- Component development / prototypes (TRL 7-8)
- Transition / Maturation (TRL 9)

Manufacturing Programs

- SBIR/STTR
- Defense ManTech
- Defense Production Act Title III

DoD Nanotechnology

R&D Investment Summary (*estimate*), $000s

CROSSCUT	FY2010	FY 2011	FY 2012
DoD			
National nanotechnology initiative	439,700	*418,600*	*368,000*
Fundamental nanoscale phenomena and processes	138,000	*180,500*	*162,900*
Nanomaterials	59,000	*33,100*	*24,100*
Nanoscale devices and systems	168,600	*146,400*	*132,300*
Instrumentation research, metrology, and standards	6,700	*2,400*	*2,100*
Nano-manufacturing	26,400	*27,700*	*20,200*
Major research facilities and instrumentation acquisition	35,600	*25,700*	*16,400*
Environment, Health and Safety	0	*0*	*0*
Education and Societal Dimensions	5,400	*2,800*	*10,000*

Ref: NNI Supplement President's FY12 Budget (www.nano.gov)

DoD Applications	Example
Electronics and Sensing	*IR focal plane arrays*
Power and Energy	*Fuel-cell catalysts*
Structural Materials	*"Fuzzy" carbon fibers*
Coatings	*Photoactive, self-cleaning films*
Multifunctional Devices	*Spin-polarized active devices*
Materials & Systems Prognosis	*Quantum-dot thermography*
Energetics	*Nano Al and reactive materials*
Chem/Bio Defense	*Chemical sensors*

FY11 MURI Topics

- Controlling the Abiotic/Biotic Interface -- Chen, UMich (Army)
- Flex-Activated Materials -- Curtin, USC (Army)
- Nanoscience–based High-speed Fabrication of Full Function Hybrid Flexible Electronic Systems -- Frisbie, UMinn (Navy)
- Atomic-scale Interphases: Exploring New Material States -- Harmer, Lehigh (Navy)
- Nanofabrication of Tunable 3D Nanotube Architectures -- Ajayan, Rice (AF)
- Biomolecule-Directed Assembly of Nanostructures -- Mirkin, Northwestern (AF)
- Nanostructural Control of Thermal and Electrical Transport Properties -- Segalman, Berkeley (AF)
- Investigation of 3-D Hybrid Integration of CMOS/Nanoelectronic Circuits -- Cheng, UCSB (AF)
- Large Scale Integrated Hybrid Nanophotonics -- Brongersma. Stanford (AF)

SUMMARY

- *Important enabling technology* and investment area for *future Defense capabilities*
- More emphasis on *nanomanufacturing* and overcoming barriers to *transition/commercialization*
- Committed to *environmental, health and safety* issues
- Value NNI *collaboration* and leverage participating agencies' programs; encourage international collaboration where appropriate

Interagency Engagement

- JDMTP Electronics Sub-panel meeting with UMass-Amherst and NNN, 29 Mar 2012, St. Augustine, FL
- Nanotechnology for Defense Conference, 6-10 Aug 2012, Summerlin, NV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Opportunities for regional, state, and local partnerships with the National Science Foundation

Ben Schrag, Ph.D.
Program Director, SBIR/STTR
Division of Industrial Innovation and Partnerships (IIP)
May 1st, 2012

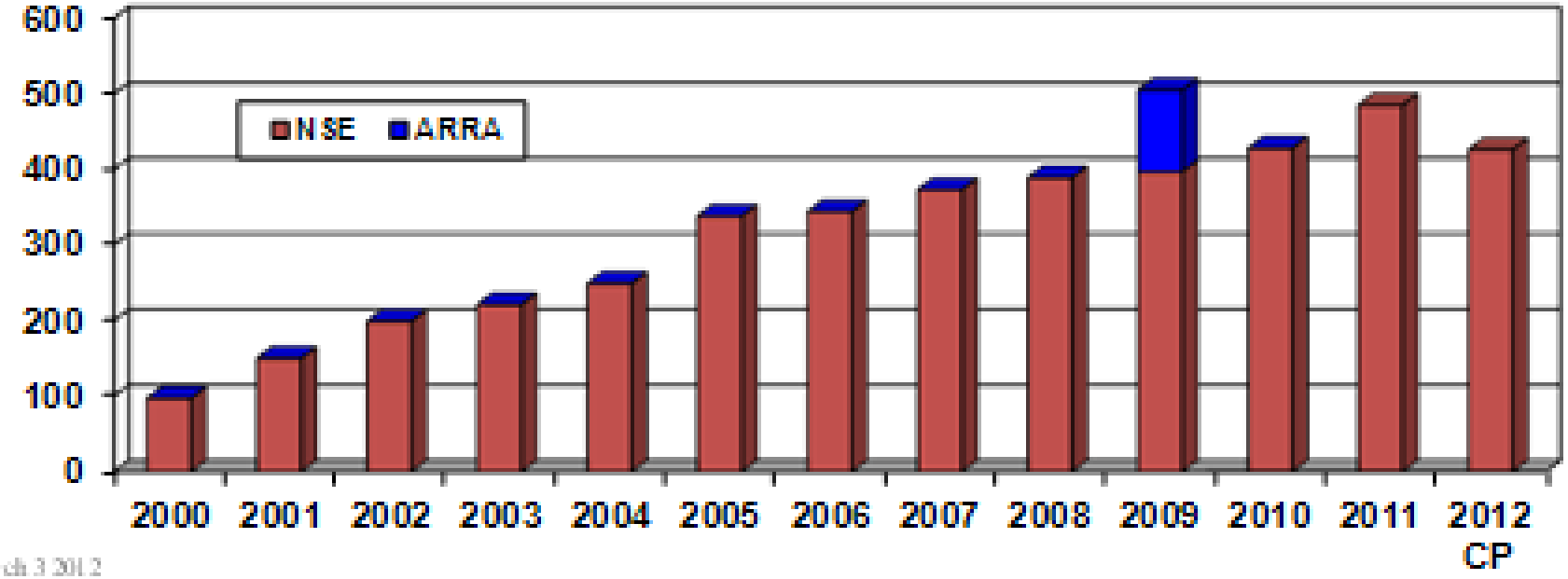
www.nsf.gov/nano/

2001-2012

Nanoscale Science and Engineering

FY 2012 C.P.: $426M across NSF

- Fundamental research and innovation in all areas of science and engineering: ~5,000 active projects in all 50 states in 2011
- Training and education: >10,000 students and teachers/y; ~$30M/y
- Infrastructure: 30 large centers, 2 large user facilities (NNIN and NCN), ~ 100 universities with major equipment and NSE teams



- The “laundry list”
  - National Nanotechnology Infrastructure Network
    - http://www.nnin.org/
  - Centers: NSEC, NNIN, NCN, etc.
    - http://www.nsf.gov/crssprgm/nano/info/centers.jsp
  - Program Solicitations (e.g. Scalable Nanomanufacturing)
    - http://www.nsf.gov/pubs/2012/nsf12544/nsf12544.htm
  - Small Business Programs (SBIR/STTR)
    - http://www.nsf.gov/eng/iip/sbir/
  - Industry/University Cooperative Research Program (I/UCRC)
    - http://www.nsf.gov/eng/iip/iucrc/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Federal Resources for the National Nanotechnology Initiative:

Department of Energy Facilities and Programs

Dr. Altaf H. Carim
Assistant Director for Nanotechnology
Office of Science and Technology Policy
Executive Office of the President

- Nanoscale Science Research Center (NSRC) user facilities
- Other user facilities: light sources, neutron scattering, electron microscopy
- Research: Office of Science core programs, Energy Frontier Research Centers (EFRCs), other
- Development and Implementation: Energy Efficiency and Renewable Energy, ARPA-E

2012 Regional, State, and Local Efforts in Nanotechnology Workshop

Portland, OR May 1, 2012

Nanoscale Science Research Centers (NSRCs): What (and where) are they?

- Dedicated research facilities for synthesis, processing, fabrication, analysis, characterization, and modeling of nanoscale materials
- Provide specialized equipment, unique tools, and support staff that are difficult for individual institutions to build and maintain

Center for Functional Nanomaterials (Brookhaven National Laboratory, NY)

Center for Nanoscale Materials (Argonne National Laboratory, IL)

Molecular Foundry (Lawrence Berkeley National Laboratory, CA)

Center for Nanophase Materials Sciences (Oak Ridge National Laboratory, TN)

Center for Integrated Nanotechnologies (Sandia & Los Alamos National Labs, NM)

NSRCs are Scientific User Facilities

- Each has its own internal staff research program, but also serves outside users throughout the scientific community
- Available to all researchers, regardless of affiliation, nationality, or source of research support
- No cost for non-proprietary work; proprietary work also possible on a cost-recovery basis, users retain IP
- Access based on peer merit review of submitted proposals (evaluated by an external Proposal Review Committee, or equivalent)
- Instruments operated primarily by facility staff, with a large majority of time made available to general users via reviewed proposals
- Limited time may be allocated at the discretion of facility management for rapid access (breaking news, very brief initial exploration, etc.)
- Collaboration with facility scientists and tapping their expertise is an important potential benefit to users, but is not required.


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