THE U.S. NATIONAL NANOTECHNOLOGY INITIATIVE: *VISION AND BEST PRACTICES*

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THE U.S. NATIONAL NANOTECHNOLOGY INITIATIVE (NNI)

Vision: *A future in which the ability to understand and control matter on the nanoscale leads to a revolution in technology and industry that benefits society.*

Goals:

- Advance a world-class nanotechnology research and development program.
- Foster the transfer of new technologies into products for commercial and public benefit.
- Develop and sustain educational resources, a skilled workforce, and a dynamic infrastructure and toolset to advance nanotechnology.
- Support responsible development of nanotechnology.


HHS/NIH
OSTP
OMB
NSF
DOE
DOD
DOC/NIST
HHS/FDA
NASA
USDA/NIFA
USDA/ARS
HHS/CDC/
NIOSH
USDA/FS
DOS
EPA
DOTr
NRC
Nano.gov
U.S. National Nanotechnology Initiative
DOT
DOC/
USPTO
IC/DNI
DOI/
USGS
DOJ
DOL
DOC/EDA
DOC/BIS
DHS
CPSC
ITC
DOEd

NATIONAL NANOTECHNOLOGY COORDINATION OFFICE (NNCO)

Role of the NNCO as mandated in the: *21st Century Nanotechnology Research and Development Act (P.L. 108-153):*

- Provide technical and administrative support
- Serve as the point of contact for the NNI
- Provide public outreach for the NNI
- Promote commercialization of nanotechnology
- Coordinate and support the reviews and assessments of the NNI

THE NNI'S NANOTECHNOLOGY SIGNATURE INITIATIVES

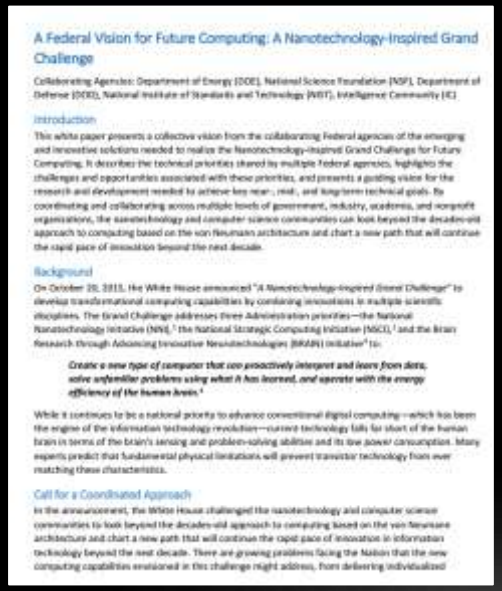
Intended to be dynamic; topical areas rotate/evolve over time.

Five current signature initiatives:

- Sustainable Nanomanufacturing
- Nanoelectronics for 2020 and Beyond
- Nanotechnology Knowledge Infrastructure
- Nanotechnology for Sensors and Sensors for Nanotechnology
- Water Sustainability through Nanotechnology

NANOTECHNOLOGY GRAND CHALLENGES

Create a new type of computer that can proactively interpret and learn from data, solve unfamiliar problems using what it has learned, and operate with the energy efficiency of the human brain



A Federal Vision for Future Computing: A Nanotechnology-Inspired Grand Challenge

Collaborating Agencies: Department of Energy (DOE), National Science Foundation (NSF), Department of Defense (DOD), National Institute of Standards and Technology (NIST), Intelligence Community (IC)

Introduction

This white paper presents a collective vision from the collaborating Federal agencies of the emerging and innovative solutions needed to realize the Nanotechnology-Inspired Grand Challenge for Future Computing. It describes the technical priorities shared by multiple Federal agencies, highlights the challenges and opportunities associated with these priorities, and presents a guiding vision for the research and development needed to achieve key near-, mid-, and long-term technical goals. By coordinating and collaborating across multiple levels of government, industry, academia, and nonprofit organizations, the nanotechnology and computer science communities can look beyond the decades-old approach to computing based on the von Neumann architecture and chart a new path that will continue the rapid pace of innovation beyond the next decade.

Background

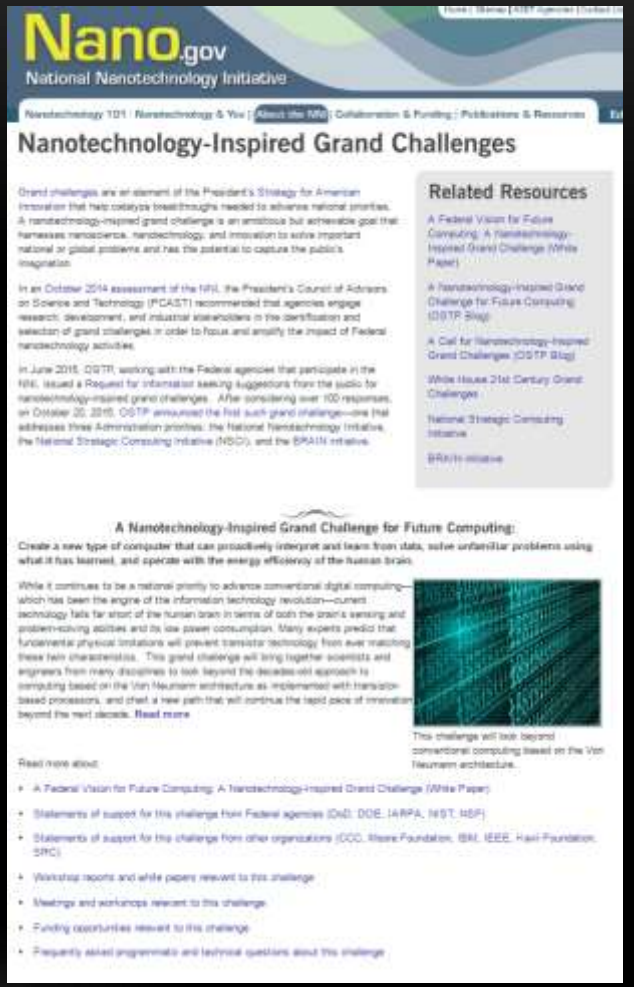
On October 20, 2015, the White House announced "*A Nanotechnology-Inspired Grand Challenge*" to develop transformational computing capabilities by combining innovations in multiple scientific disciplines. The Grand Challenge addresses three Administration priorities—the National Nanotechnology Initiative (NNI),[1] the National Strategic Computing Initiative (NSCI),[2] and the Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative[3] to:

> ***Create a new type of computer that can proactively interpret and learn from data, solve unfamiliar problems using what it has learned, and operate with the energy efficiency of the human brain.***[4]

While it continues to be a national priority to advance conventional digital computing—which has been the engine of the information technology revolution—current technology falls far short of the human brain in terms of the brain's sensing and problem-solving abilities and its low power consumption. Many experts predict that fundamental physical limitations will prevent transistor technology from ever matching these characteristics.

Call for a Coordinated Approach

In the announcement, the White House challenged the nanotechnology and computer science communities to look beyond the decades-old approach to computing based on the von Neumann architecture and chart a new path that will continue the rapid pace of innovation in information technology beyond the next decade. There are growing problems facing the Nation that the new computing capabilities envisioned in this challenge might address, from delivering individualized



Nano.gov
National Nanotechnology Initiative

Nanotechnology 101 | Nanotechnology & You | About the NNI | Collaboration & Funding | Publications & Resources

Nanotechnology-Inspired Grand Challenges

Grand challenges are an element of the President's Strategy for American Innovation that help catalyze breakthroughs needed to advance national priorities. A nanotechnology-inspired grand challenge is an ambitious but achievable goal that harnesses nanoscience, nanotechnology, and innovation to solve important national or global problems and has the potential to capture the public's imagination.

In an October 2014 assessment of the NNI, the President's Council of Advisors on Science and Technology (PCAST) recommended that agencies engage research, development, and industrial stakeholders in the identification and selection of grand challenges in order to focus and amplify the impact of Federal nanotechnology activities.

In June 2015, OSTP, working with the Federal agencies that participate in the NNI, issued a Request for Information seeking suggestions from the public for nanotechnology-inspired grand challenges. After considering over 100 responses, on October 20, 2015, OSTP announced the first such grand challenge—one that addresses three Administration priorities: the National Nanotechnology Initiative, the National Strategic Computing Initiative (NSCI), and the BRAIN Initiative.

Related Resources

A Federal Vision for Future Computing: A Nanotechnology-Inspired Grand Challenge (White Paper)

A Nanotechnology-Inspired Grand Challenge for Future Computing (OSTP Blog)

A Call for Nanotechnology-Inspired Grand Challenges (OSTP Blog)

White House 21st Century Grand Challenges

National Strategic Computing Initiative

BRAIN Initiative

A Nanotechnology-Inspired Grand Challenge for Future Computing:

Create a new type of computer that can proactively interpret and learn from data, solve unfamiliar problems using what it has learned, and operate with the energy efficiency of the human brain.

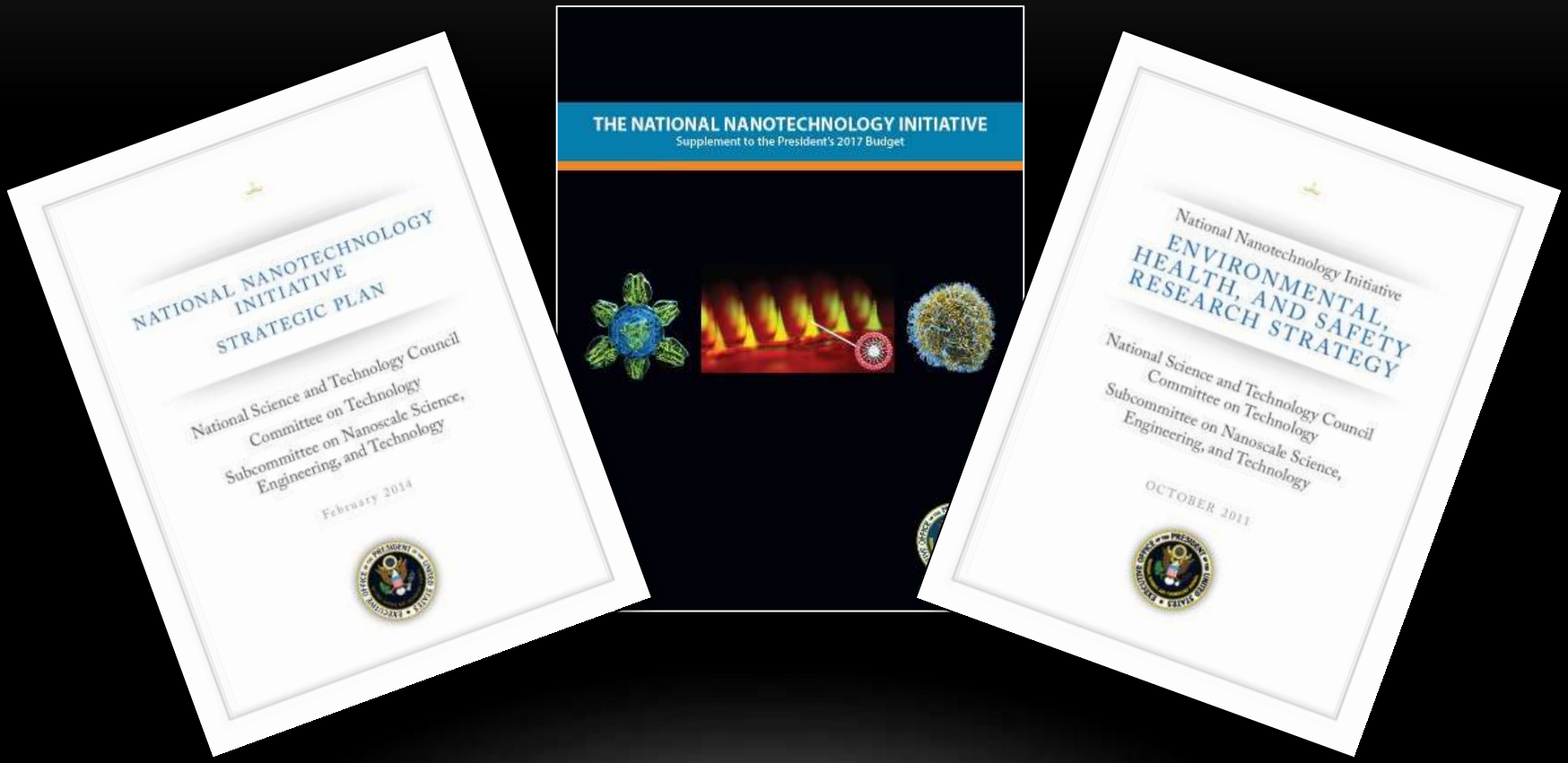
While it continues to be a national priority to advance conventional digital computing—which has been the engine of the information technology revolution—current technology falls far short of the human brain in terms of both the brain's sensing and problem-solving abilities and its low power consumption. Many experts predict that fundamental physical limitations will prevent transistor technology from ever matching these twin characteristics. This grand challenge will bring together scientists and engineers from many disciplines to look beyond the decades-old approach to computing based on the Von Neumann architecture as implemented with transistor-based processors, and chart a new path that will continue the rapid pace of innovation beyond the next decade. Read more

This challenge will look beyond conventional computing based on the Von Neumann architecture.

Read more about:

- A Federal Vision for Future Computing: A Nanotechnology-Inspired Grand Challenge (White Paper)
- Statements of support for this challenge from Federal agencies (DoD, DOE, IARPA, NIST, NSF)
- Statements of support for this challenge from other organizations (CCC, Rhone Foundation, IBM, IEEE, Hart Foundation, SRC)
- Workshop reports and white papers relevant to this challenge
- Meetings and workshops relevant to this challenge
- Funding opportunities relevant to this challenge
- Frequently asked programmatic and technical questions about this challenge

KEY NNI DOCUMENTS



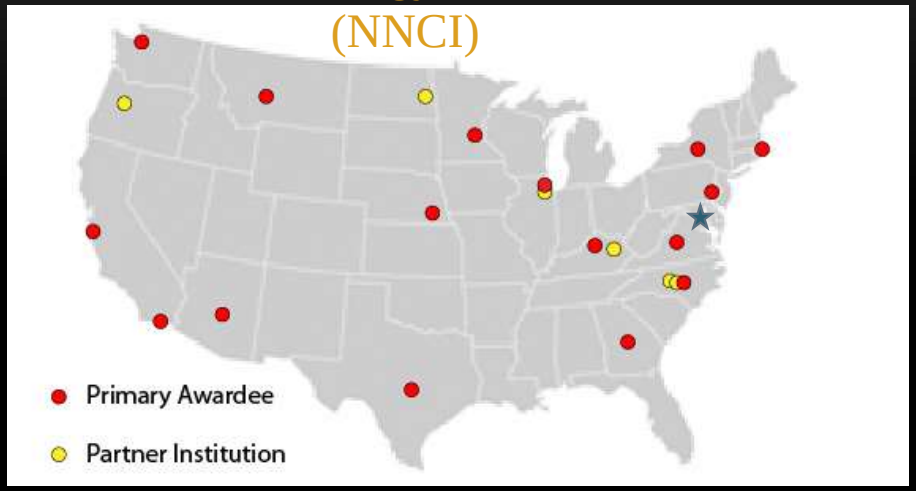
GUIDANCE DOCUMENTS ON THE SAFE USE OF NANOTECHNOLOGIES

Examples of Guidance Documents Developed by NNI Agencies

NNI USER FACILITIES

Dan Sears, the University of North Carolina at Chapel Hill

NSF National Nanotechnology Coordinated Infrastructure (NNCI)

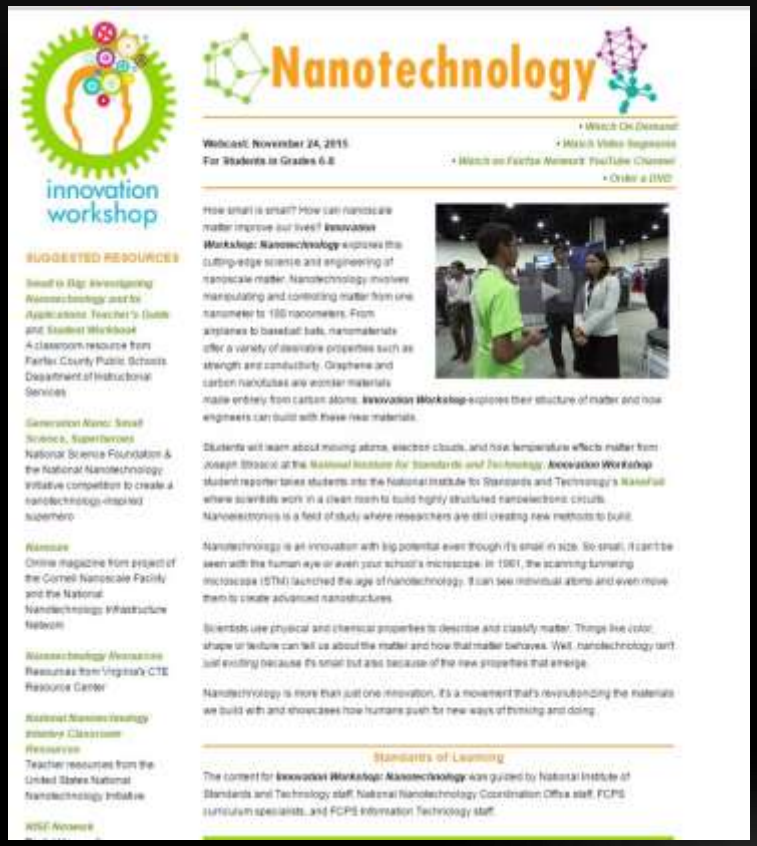


★ NIST Center for Nanoscale Science and Technology (CNST)

DOE Basic Energy Sciences User Facilities

Nanoscale Science Research Centers
Electron-Beam Microcharacterization Centers
Light and Neutron Sources

COLLABORATION FOR GREATER IMPACT IN EDUCATION AND OUTREACH

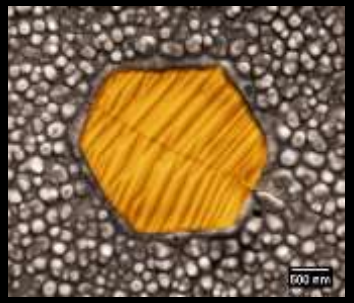


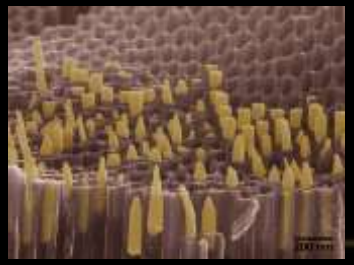
RESOURCES FOR TEACHERS AND STUDENTS

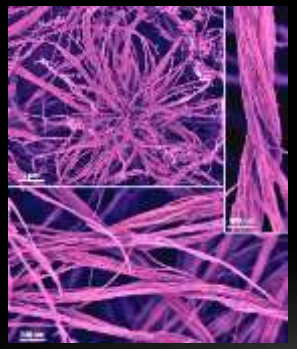
BUILDING THE NANOTECHNOLOGY COMMUNITY

EnvisioNano

NanoFilm








NSF AND NNI PRESENT A COMPETITION:
GENERATION NANO
SMALL SCIENCE, SUPERHEROES


I'LL USE MY NANOSENSORS TO FIND HIM...


DILATANT


BOOM


The suit's Liquid armor. It hardens on impact, so your bullet won't hurt me at all.


POW

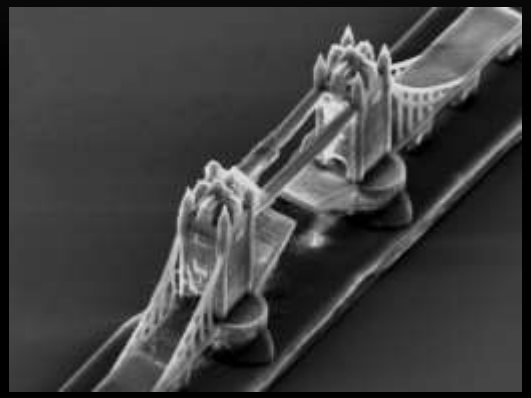

With my newly developed nanotechnology, I can save thousands from disease!

us – eu
bridging nanoEHS research efforts

Communities of Research (CoRs)

Databases & Computational Modeling for NanoEHS
Fred Klaessig Pennsylvania Bio Nano Systems, US
Barry Hardy, Douglas Connect, Switzerland

Exposure through Product Life
Paul Westerhoff, Arizona State University, US
Christof Asbach, Institute of Energy and Environmental Technology, Germany



http://www.tuwien.ac.at/en/news/news_detail/article/7444/

Risk Management & Control
Vince Castranova, National Institute of Occupational Safety and Health (NIOSH), US
Ulla Vogel, National Research Centre for the Working Environment (NRCWE), Denmark

Risk Assessment
Christine Hendren, Duke University, US
Janeck Scott-Fordsmand, Aarhus University, Denmark

Characterisation
Anil Patri Food and Drug Administration, US
Kenneth Dawson, University College Dublin, Ireland

EcoToxicity
Elijah Petersen, National Institute of Standards & Technology, US
Nico van de Brink Wageningen University, Netherlands

Human Toxicity
Gabriele Windgasse, Columbia University, US
Albert Duschl, University of Salzberg, Austria

THANK YOU.

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