

Science Policy Case Study: NNI

AP Seminar
September 24, 2014

Last Week's Events



Full Committee Hearing - The Administration's Climate Plan: Failure by Design

2318 Rayburn House Office Building Washington, D.C.
20515 | Sep 17, 2014 10:00am

The Administration's Climate Plan: Failure by Design

Witnesses

The Honorable John Holdren, Director, Office of Science and Technology Policy, Executive Office of the President

Ms. Janet McCabe, Acting Assistant Administrator, Office of Air and Radiation, U.S. Environmental Protection Agency





Jon Stewart on Monday slammed a U.S House hearing regarding climate change, comparing the Republican-led session to “pushing a million pounds of idiot up a mountain.”

<http://www.mediaite.com/tv/stewart-blows-up-on-gop-over-climate-change-pushing-a-million-pounds-of-idiot-up-a-mountain/>

Science Policy Committees

Red

White

Blue

Green

Thaer Al-Sheikh Theeb

Isabel Baransky

Ross Basri

Sergio Becerra

Haris Durrani

Adrian Febre

Mark Greenan

Maksim Grinchenko

Minyong Han

Cole Stephens

Ari Turkiewicz

Anton Baleato Lizancos

Sean Ballinger

Joshua Cohen

Richard Creswell

Jonathan Fletcher

Omar Mahmood

Seth Olsen

Jason Williams

Lucas Zeppetello

Last Week's Assignment

- Contact everyone in your policy committee
- Discuss and listen:

How can you apply your understanding of applied physics to address a national policy issue?

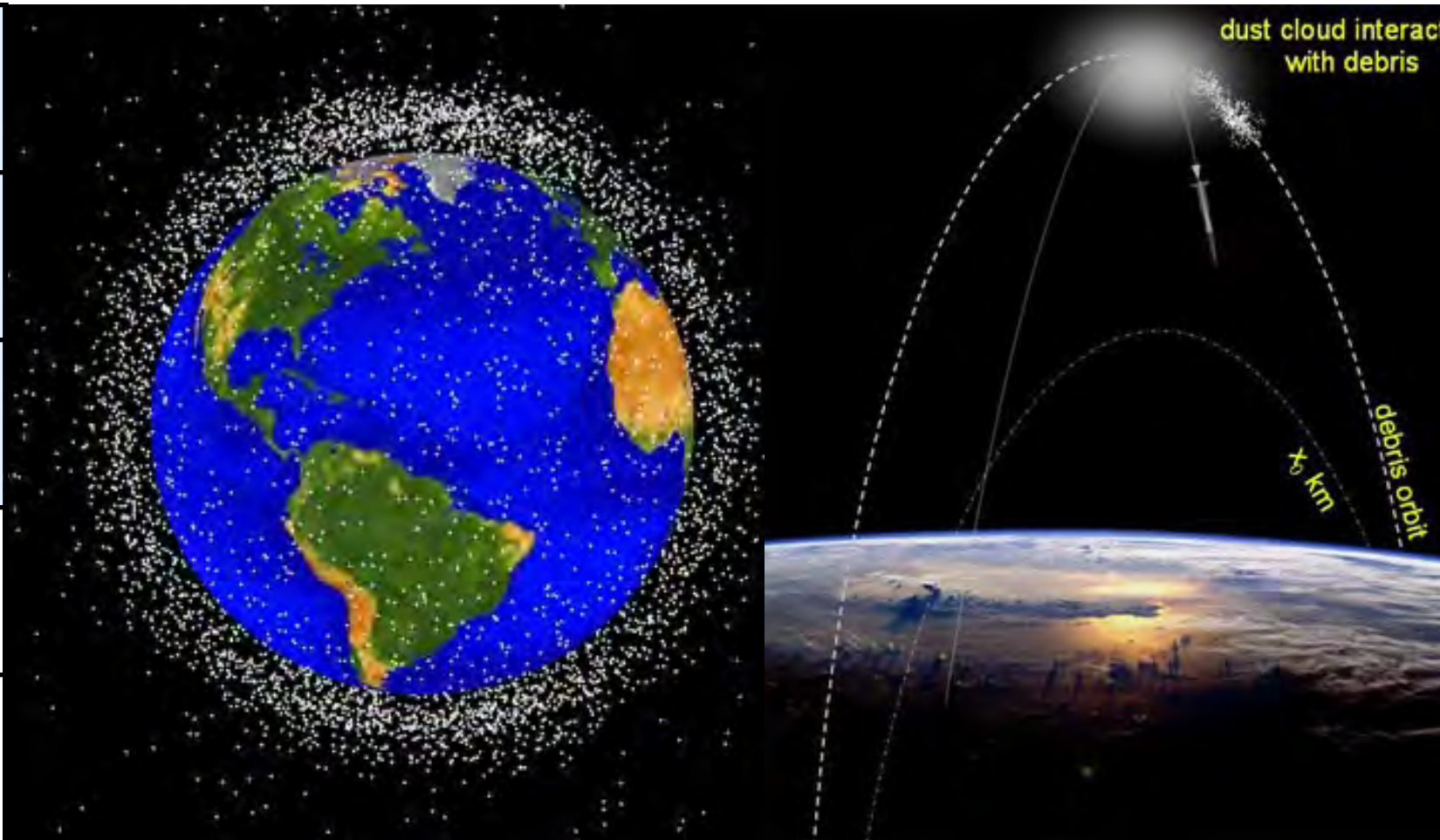
- Report one or more ideas next week.

(One or two sentences please.)

Red Panel

Based on our conversations in last class, our group discussed **fusion energy** and **solar power**, but everyone is still leaning toward our original proposal for space debris and policy. We might be interested in exploring policy related to the NRL's [drag enhancement](#) or similar debris remediation methods, but these are only general ideas so far!

Thaer Al-Sheikh Theeb
Haris Durrani
Minyong Han
Sean Ballinger
Omar Mahmood



White Panel

Isabel Baransky

Adrian Febre

Cole Stephens

Joshua Cohen

Seth Olsen

- We propose that a report be made on the most efficient, from a cost and energy standpoint, **alternative energy sources implemented around the world since 2010**. As other countries continue to develop nuclear energy as a cheap means to stray from reliance on fossil fuels, it is important for the US to not only develop its own technology, but cooperate with other countries.
- We propose an increase of funding for **research and development of the robotic harvesting and processing of extraterrestrial materials**. The intents are to severely reduce the costs of production of fuels and materials thus providing exponentially increased range of aerospace travel, and to increase our knowledge of extraterrestrial raw materials (ice, regolith, etc).
- We propose the creation of a **flagship charter school specializing in STEM education targeted towards students in low-income families**. The intents are to encourage STEM education for all socioeconomic groups, redistribute and increase access to more proficient educators, and dispel the negative stigmas surrounding STEM fields for both educators as well as students.

Blue Panel

Ross Basri

Mark Greenan

Ari Turkiewicz

Richard Creswell

Jason Williams

?

Green Panel

Green Panel discussed sources of energy; particularly **coal**.

Studies show that it is one of the dirtiest fuels, yet is the source of 40 percent of our energy production. We posited that reducing this percentage would be an effective method of easing the environmental burden; however, we also noted that the coal industry is embedded in the economies of coal producing states. Meaning certain states would be reluctance to switch to a different form of energy. This in turn led us to consider ways to redirect the labor of the people in these areas. We also want to look into possible advances in energy transportation to replace some of the local coal energy.

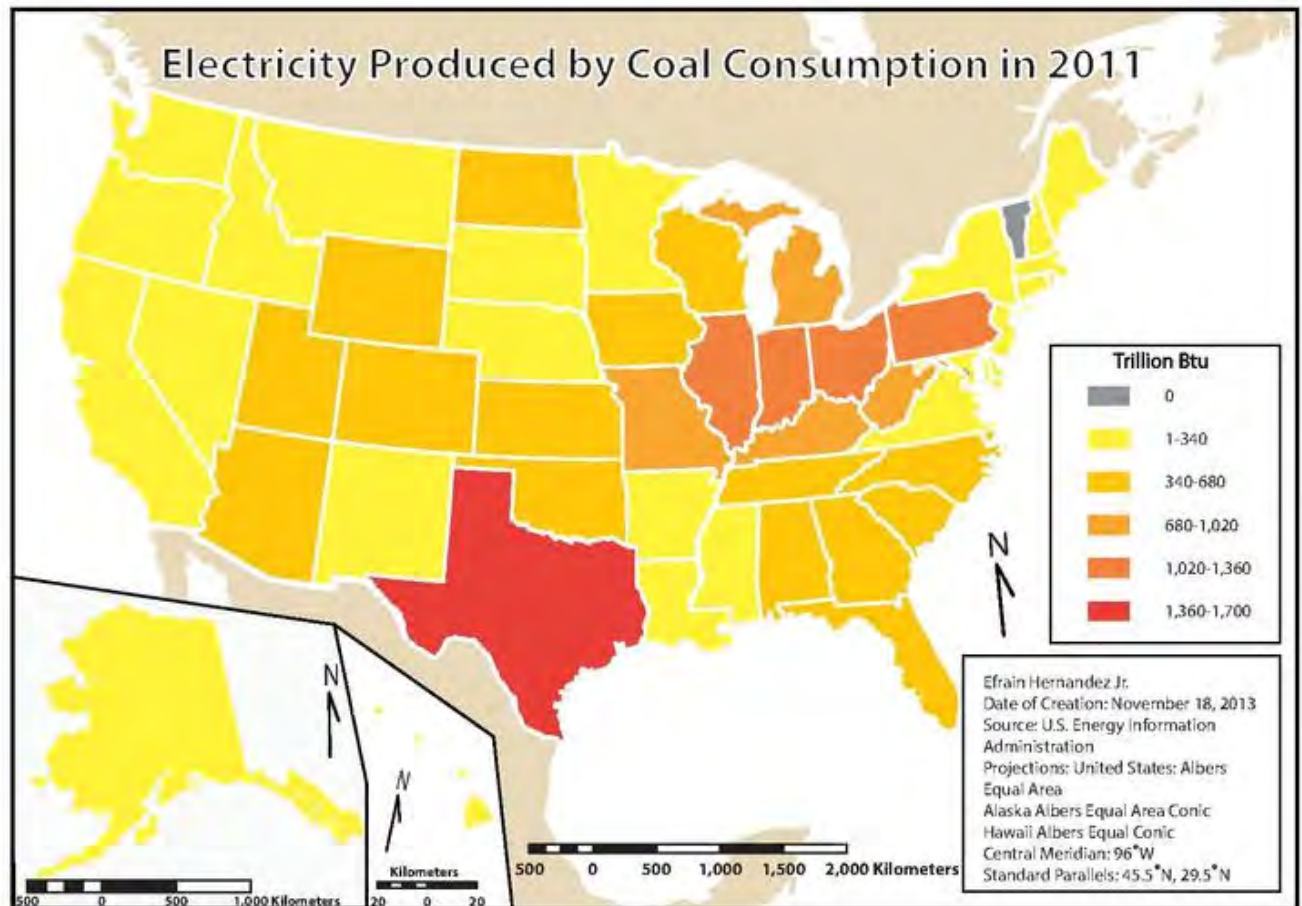
Sergio Becerra

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President Clinton Launches National Nanotechnology Initiative

For Immediate Release January 21, 2000

REMARKS BY THE PRESIDENT

AT SCIENCE AND TECHNOLOGY EVENT California Institute of Technology Pasadena, California



Neal Lane, professor of physics at Rice University, director of NSF from 1993 to 1998, and Assistant to the President for Science and Technology and Director of the White House Office of Science and Technology Policy under President Bill Clinton from August 1998 to January 2001.

The budget I will submit to Congress in just a few days will include a \$2.8 billion increase in our 21st century research fund. ...

My budget supports **a major new national nanotechnology initiative worth \$500 million**. Caltech is no stranger to the idea of nanotechnology, the ability to manipulate matter at the atomic and molecular level. Over 40 years ago, Caltech's own Richard Symonds asked, what would happen if we could arrange the atoms one by one the way we want them? Well, you can see one example of this in this sign behind me, that Dr. Lane furnished for Caltech to hang as the backdrop for this speech. It's the Western hemisphere in gold atoms. But I think you will find more enduring uses for nanotechnology.

Nano.gov

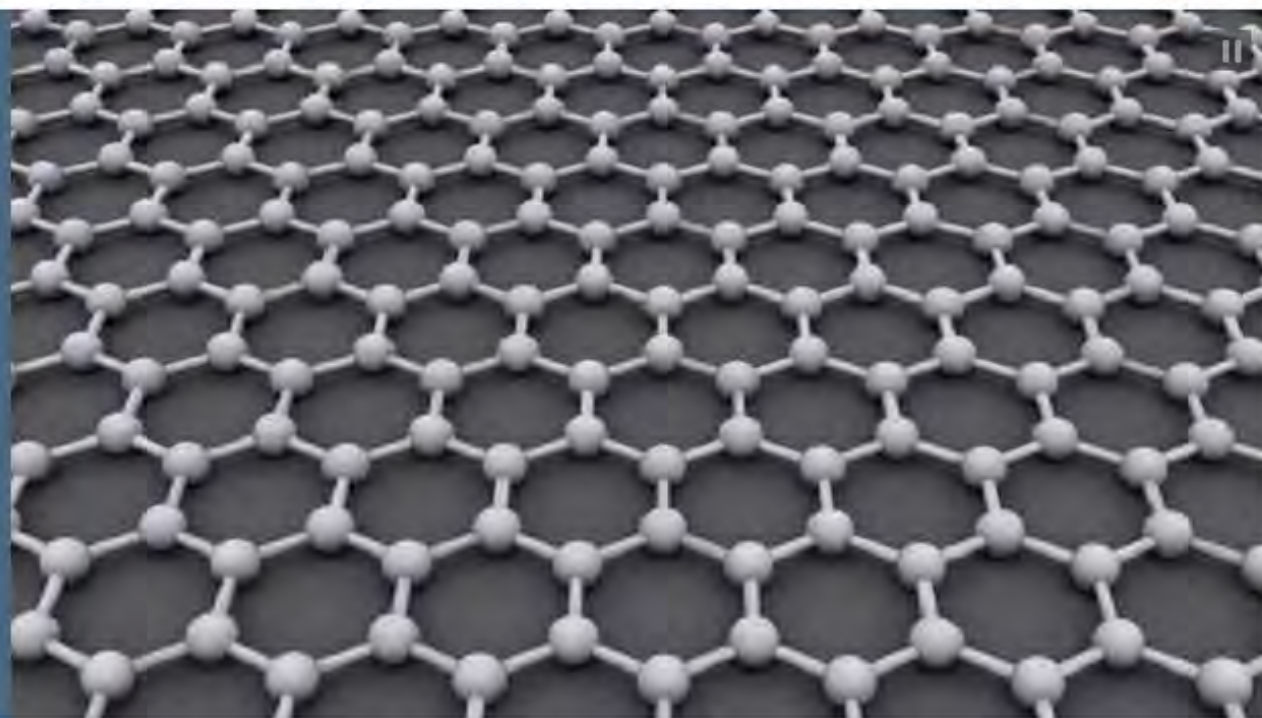
National Nanotechnology Initiative

[Nanotechnology 101](#) | [Nanotechnology & You](#) | [About the NNI](#) | [Collaboration & Funding](#) | [Publications & Resources](#)

[Education](#) | [Newsroom](#) | [Events](#)

Atom-Sized Construction Could Shrink Future Gadgets

The Pentagon's recently launched Atoms to Product (A2P) program aims to develop atom-size materials to build state-of-the-art military and consumer products. [Read more](#)



[Slideshow Archive](#)



Nanotechnology Alert: DoD requesting info on proposed manufacturing centers

President Obama proposes the creation of 45 centers through a major new initiative, the National Network for Manufacturing Innovation. Proposed focus areas may have nano-enabled solutions.

Nanotechnology News

When a doughnut becomes an apple
Sept 23, 2014 - Phys.Org

Graphene biosensor more sensitive than bioassay tests in detecting cancer

Sept 22, 2014 - Tech Times

Smallest possible "diamonds" help form ultra-thin nanothreads

Sept 22, 2014 - Research & Development



Learn About Nanotechnology



Nanotechnology Initiative: The Most Recent Science Policy Success Story

“As of 2009, this new knowledge underpinned about a quarter of a trillion dollars worldwide market, of which about \$91 billion was in U.S. products that incorporate nanoscale components.” (*Mihail C. Roco, 2011*)

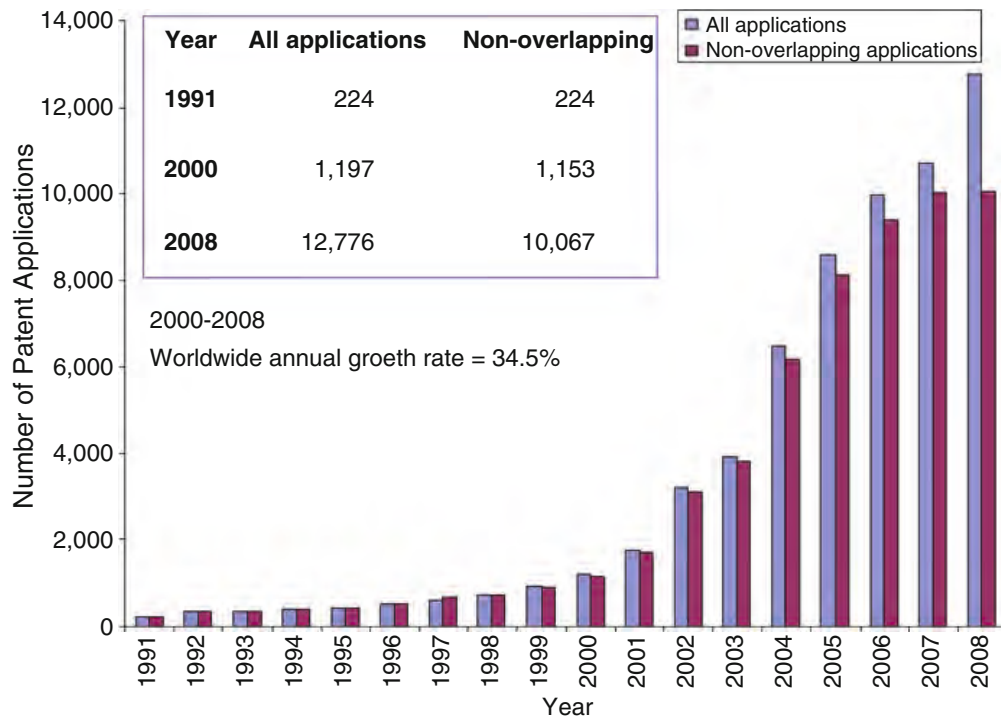


Fig. 2 Total number of nanotechnology patent applications in 15 leading patent depositories in the world from 1991–2008. Two sets of data are reported based on the number of all nanotechnology patent applications and the number of non-overlapping nanotechnology patent applications (by considering one patent application per family of similar patents submitted at more than one depository) [12]

Table 2 Examples of penetration of nanotechnology in several industrial sectors. The market percentage and its absolute value affected by nanotechnology are shown for 2010

U.S.	2000	2010	Est. in 2020
Semiconductor industry	0 (with features <100 nm)	60% (~\$90B)	100%
New nanostructured catalysts	0 (new nanoscale behavior)	30% (~\$45B)	100%
Pharmaceuticals (therapeutics and diagnostics)	0	~35% (~\$35B impact)	~ 50%
Wood	0	~15% (~\$70B)	~50%
		0	~20%

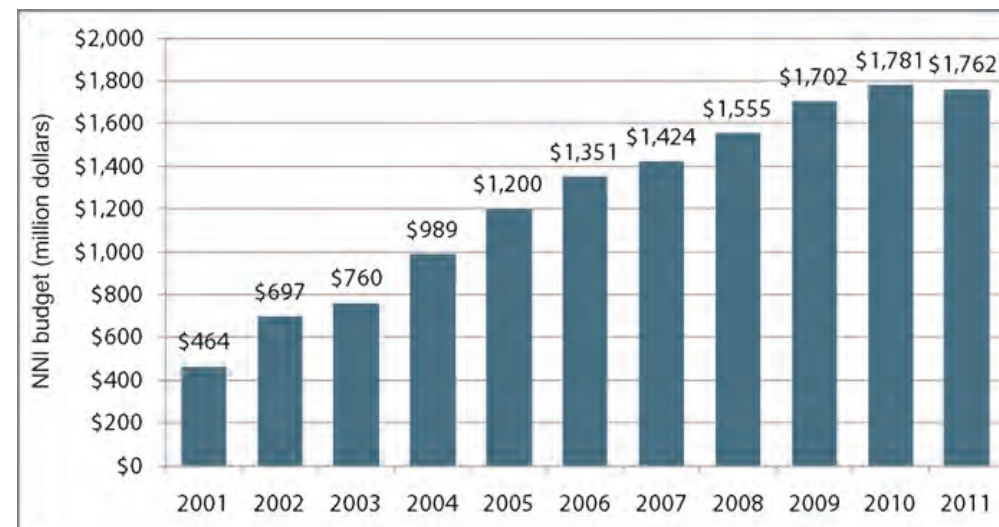


Fig. 8 NNI budgets for fiscal years 2001–2011 in millions U.S. dollars. The 2009 budget does not include the one-time supplemental ARRA funding in 2009 of \$511 million

Yesterday, President Obama's campaign swing took him through Albany, where he and Gov. Cuomo heaped praise on SUNY Albany's College of Nanoscale Science and Engineering. The applause is bipartisan: Mitt Romney has cited Albany's nanotechnology sector as an area "vital to the economy and to our nation's competitiveness."

In other words, state government got this one right. But it's important to understand just *what* it got right.

As chairman of SUNY's Finance and Community College Committees and of its Construction Fund during the period of the NanoCollege's development, I witnessed its effective and efficient use of state funds and facilities and of SUNY's higher-education platform to foster economic growth.

Then-Gov. George Pataki announced the Center of Excellence in Nanoelectronics and Nanotechnology at SUNY Albany in his **2001 State of the State Address**. Since then, the facility has grown to become the world's foremost innovator in nanotechnology instruction, invention and investment.

NEW YORK POST

Behind New York's nanotech triumph

By Ed Cox

May 9, 2012 | 4:00am



George E. Pataki

Photo: UPI

The Foundations of Nanoscience

- 1986: Ernst Ruska "for his fundamental work in electron optics, and for the design of the first electron microscope", the other half jointly to Gerd Binnig and Heinrich Rohrer "for their design of the **scanning tunneling microscope**."
- 1996: Robert F. Curl Jr., Sir Harold W. Kroto and Richard E. Smalley "for their **discovery of fullerenes**".
- 1997: Steven Chu, Claude Cohen-Tannoudji and William D. Phillips "for development of methods to cool and trap atoms with laser light".
- 2007: Albert Fert and Peter Grünberg "for the discovery of Giant Magnetoresistance"

<http://www.research.ibm.com/articles/heinrich-rohrer.shtml>

<http://www-03.ibm.com/ibm/history/ibm100/us/en/icons/microscope/>



Richard Smalley

Richard E. Smalley, 62, Dies; Chemistry Nobel Winner

By [BARNABY J. FEDER](#)

Published: October 29, 2005

Nanotechnology derives its name from the nanometer, which is a billionth of a meter and the size of a small molecule. Researchers have discovered that not just carbon but numerous other materials have novel and potentially valuable traits when formed with dimensions of under 100 nanometers.

Dr. Smalley was as excited by the commercial potential of nanotechnology as the science. In 2000, he helped -found Carbon Nanotechnologies and became its chairman.

He also became an outspoken advocate for the National Nanotechnology Initiative, a government-financed research program founded under President [Bill Clinton](#) and expanded into a multibillion-dollar investment under President Bush.

Dr. Smalley was particularly interested in the possibility that carbon nanotubes could one day be woven into long transmission wires that would be far lighter, stronger and more efficient than today's electrical grid. He also saw nanotechnology as the key to producing solar and other renewable energy sources that could replace fossil fuels.

"You are about to be in the center of the world," he told scientists at the National Renewable Energy Laboratories in Golden, Colo., in a lecture in 2003 outlining the population and resource pressures the world would face as fossil-fuel reserves declined and energy demands rose. "Clean water is a great example of something that depends on energy. And if you solve the water problem, you solve the food problem."



Nanotechnology's Power Broker

Dr. M.C. Roco is Senior Advisor for Nanotechnology at the National Science Foundation, and Chair of the U.S. National Science and Technology Council (NSTC)'s Subcommittee on Nanoscale Science, Engineering and Technology (NSET). Dr. Roco has been a key architect of the National Nanotechnology Initiative (NNI), and a leader of the Converging New Technologies (NBIC: nano-bio-info-cognitive sciences) activities.

Forbes magazine recognized him in 2003 as the first among "Nanotechnology's Power Brokers" and Scientific American named him one of 2004's top 50 Technology Leaders.



Nanotechnology's Power Broker

“On behalf of the interagency group, on March 11, 1999, in the historic Indian Hall at the White House’s Office of Science and Technology Policy (OSTP), I proposed the NNI with a budget of half billion dollars for fiscal year 2001. I was given 10 minutes to make the case.

While two other topics were on the agenda of that meeting, nanotechnology captured the imagination of those present and discussions reverberated for about two hours. It was the first time that a forum at this level with representatives from the major federal R&D departments reached a decision to consider exploration of nanotechnology as a national priority. In parallel, over two dozen of other competing topics were under consideration by OSTP for priority funding in fiscal year 2001.

We had the attention of Neal Lane, then the Presidential Science Advisor, and Tom Kalil, then economic assistant to the President. However, few experts gave even a small chance to nanotechnology to become a national priority program. However, after a long series of evaluations, NNI was approved and had a budget of \$489 million in FY 2001.”



Nanotechnology's Power Broker

After that presentation, our focus changed. Because nanotechnology was not known to Congress or the Administration, establishing a clear definition of nanotechnology and communicating the vision to large communities and organizations took the center stage.

Indeed, the period from March 1999 through the end of the year was a time of very intense activity. Few experts gave even a small chance to nanotechnology for special funding by the White House. Nevertheless, with this proposal and the “homework” of studies completed, we focused our attention on the six major federal department and agencies -- the National Science Foundation (NSF), Department of Defense (DOD), Department of Energy (DOE), NASA, National Institutes of Health (NIH) and the National Institute of Standards and Technology (NIST) -- that would place nanotechnology as a top priority during the summer of 1999.



Nanotechnology's Power Broker

We provided detailed technical input for two hearings in the Congress, in both the Subcommittee on Basic Science, Committee on Science, U.S. House of Representatives (June 22, 1999) and the Senate, and support was received from both parties.

The preparatory materials included a full 200-page benchmarking report, ten-page research directions and one-page summary on immediate goals. After the Hearing in the House, Nick Smith, the Chair of the first public hearing in preparation of NNI, told “Now we have sufficient information to aggressively pursue nanotechnology funding.” Rick Smalley came and testified despite his illness.



Nanotechnology's Power Broker

Then, the approval process moved to Office of Management and Budget (OMB) (November 1999), Presidential Council of Advisors in Science and Technology (PCAST) (December 1999) and the Executive Office of the President (EOP, White House) (January 2000), and had supporting hearings in the House and Senate of the US Congress (Spring 2000).

In November 1999, the OMB recommended nanotechnology as the only new R&D initiative for fiscal year 2001. On December 14, 1999, the PCAST highly recommended that the President fund nanotechnology R&D.



Nanotechnology's Power Broker

Thereafter, it was a quiet month – we had been advised by the Executive Office of the President to restrain from speaking to the media about the topic because a White House announcement would be made. We prepared a draft statement. A video was being produced for the planned multimedia presentation, but we did not have time to complete it.

President Clinton announced the NNI at Caltech in January 2000 beginning with words such as “Imagine what could be done....” He used only slides. After that speech, we moved firmly in preparing the Federal plan for R&D investment, to identify the key opportunities and convincing potential contributors to be proactive. House and Senate hearings brought the needed recognition and feedback from Congress.



NATIONAL NANOTECHNOLOGY INITIATIVE

FROM VISION TO IMPLEMENTATION

M.C. Roco

Senior Advisor, NSF, www.nsf.gov/nano

Chair, NSTC's Subcommittee on Nanoscience,
Engineering and Technology (NSET), nano.gov

Presented November, 2000