

WHITE HOUSE 21ST CENTURY GRAND CHALLENGES



Ambitious but achievable goals
that harness science, technology, and
innovation to solve important national
or global problems
and have the potential to capture the
public's imagination.

Lloyd Whitman
OSTP



Neuromorphic Computing
6 • 26 • 2016

EXAMPLES

DOE SunShot
Grand Challenge



DOE EV Everywhere
Grand Challenge

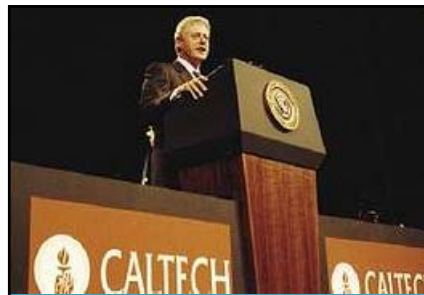


NASA Asteroid
Grand Challenge

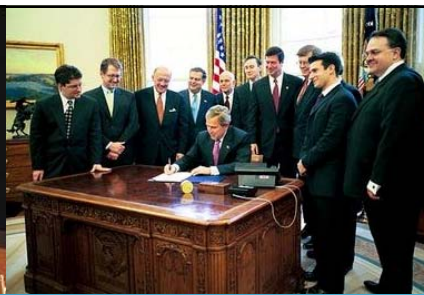




WHY A NANOTECHNOLOGY-INSPIRED GRAND CHALLENGE?



President Clinton
at CalTech
January 21, 2000

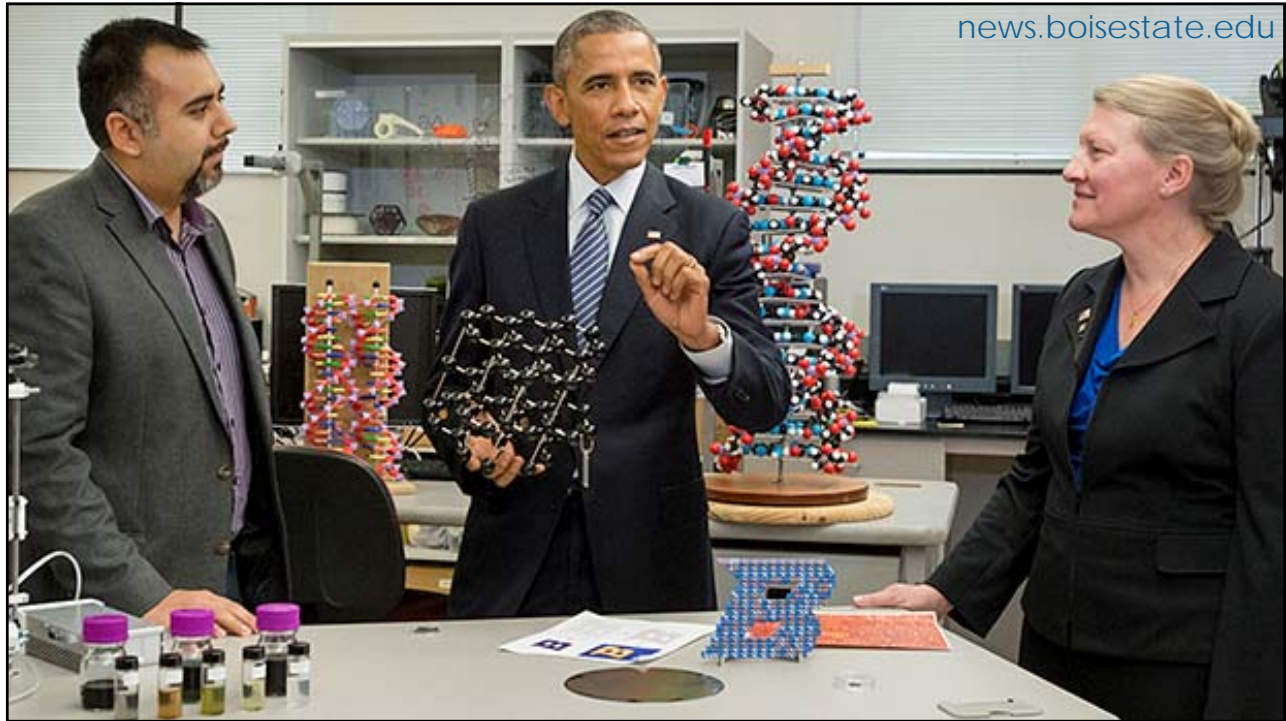


President Bush
signs NNI act
December 3, 2003



President Obama
at Boise State
January 21, 2015

NNI SUPPORTED BY **3 PRESIDENTS**



NNI TODAY

20 Federal Departments and Independent Agencies

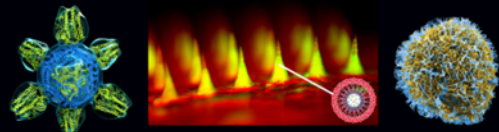
11 with nanotech budgets

\$1.43 billion 2016 budget

\$22 billion since 2001

Learn more: www.nano.gov

THE NATIONAL NANOTECHNOLOGY INITIATIVE
Supplement to the President's 2017 Budget



2017 Budget Supplement

ECONOMIC IMPACT IS GROWING

Lux Research: Global nanotech product revenue

\$**164 billion** in 2008
\$**1.6 trillion** in 2014
\$**3.7 trillion** by 2018



Nanotecnología
Cosas Grandes de un Mundo Diminuto

EDUCATION

Planeta pequeño. Planeta bien, bien pequeño... más pequeño que lo que has visto a través de un microscopio en la escuela. Planeta en átomos y moléculas, y ahora en bits. Has llegado a la nanotecnología, el científico está aprendiendo a componer los componentes fundamentales que componen el mundo que nos rodea.

R&D

FULFILLING THE PROMISE: NNI 2.0

Energize the ecosystem
Catalyze commercialization

Building a Safety Program to Protect the Nanotechnology Workforce: A Guide for Small to Medium-Sized Enterprises

EHS & ELSI

Technology too small to see
Results too big to ignore

Commerce

TuffTek
Revolution with insects that last as long as nearest competitor.

TuffTek
1-800-392-2299 • tufftek.com
10000
10000

NANOTECHNOLOGY -INSPIRED GRAND CHALLENGES

Ambitious but achievable goals

that harness **nano**science, **nano**technology, and innovation to solve important national or global problems

and have the potential to capture the public's imagination.

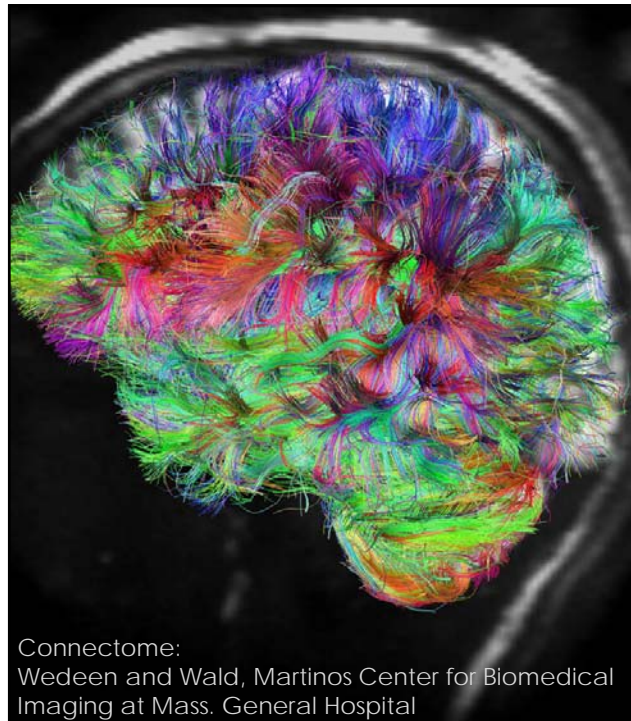


THE PROBLEM

70 years of Von Neumann architecture

50 years of silicon transistor-based digital computers

Hitting the limits of size and power scaling



Connectome:
Wedeen and Wald, Martinos Center for Biomedical
Imaging at Mass. General Hospital

A DIFFERENT APPROACH

3-Dimensional
Fault tolerant
Adaptive

~ 10^{11} neurons

~ 10^{15} connections

Perception
Learning
Creative problem-solving



The IBM Blue Gene/Q Sequoia supercomputer
Lawrence Livermore National Laboratory

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.

DoD
DOE
IARPA
NIST
NSF

CCC
Moore Foundation
IEEE
Kavli Foundation
SRC



Nano.gov
U.S. National Nanotechnology Initiative

National Strategic Computing Initiative