Engineering and America's Future

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Key White House Engineering Initiatives

– Multi-agency research initiatives with engineering at the core

–Entrepreneurship Education

–White House Maker Faire, and Making

–Engineering as part of K-12 learning

– Undergraduate Engineering

President Obama's Innovation Strategy

Catalyze Breakthroughs for National Priorities

- Unleash a clean energy revolution
- Support advanced vehicle technology
- Drive breakthroughs in health IT
- Address the "grand challenges" of the 21st century

Promote Competitive Markets that Spur Productive Entrepreneurship

- Promote American exports
- Support open capital markets that allocate resources to the most promising ideas

- Encourage high-growth and innovation-based entrepreneurship
- Improve public sector innovation and support community innovation

Invest in the Building Blocks of American Innovation

- Restore American leadership in fundamental research
- Educate the next generation with 21st century knowledge and skills while creating a world-class workforce
- Build a leading physical infrastructure
- Develop an advanced information technology ecosystem

Research Initiatives with Engineering at Core

- Grand Challenges
- Cyber-Physical Systems
- Robotics
- Engineering Biological Systems
- Advanced Manufacturing, NNMI
- Materials Genome
- Big Data

Current Administration Grand Challenges
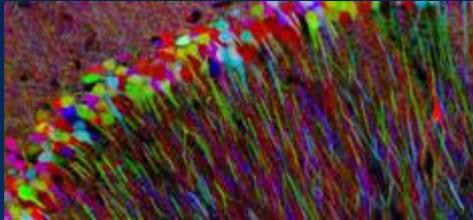
NIH, DARPA, and NSF BRAIN Initiative, to revolutionize our understanding of the human mind and uncover new ways to treat, prevent, and cure brain disorders like Alzheimer's, schizophrenia, autism, epilepsy, and traumatic brain injury

DOE SunShot Grand Challenge, to make solar energy cost competitive with coal by the end of the decade, and **EV Everywhere Grand Challenge**, to make electric vehicles that are as affordable as today's gasoline-powered vehicles within the next 10 years

NASA's Asteroid Grand Challenge, to find all asteroid threats to human populations and know what to do about them

USAID's Grand Challenges for Development, including **Saving Lives at Birth** that catalyzes groundbreaking prevention and treatment approaches for pregnant women and newborns in poor, low resource communities

Private Sector Grand Challenges

- **Google** – self-driving car (outgrowth of DARPA Challenge)

- **IBM** – AI that beats Gary Kasparov at chess, Ken Jennings at Jeopardy

- **Qualcomm** – Tricorder X Prize

- **Elon Musk/SpaceX** – humanity should become a multi-planetary species – "I want to die on Mars"

Grand Challenge Scholars Program

- Program has five components:
    - Research related to NAE Grand Challenge
    - Engineering + (interdisciplinary curriculum)
    - Entrepreneurship
    - Global Dimension
    - Service Learning

- Currently has 14 schools participating, would be great to increase this number and set a collective goal of number of students

Entrepreneurship Education

- Goal: provide more experiential entrepreneurship education – and convert from scientific and engineering results into successful technologies.

- NSF I-Corps
  - Public-private partnership to commercialize NSF research
  - I-Corps mentors are technology developers, business leaders, venture capitalists, and others from private industry
  - Applying the "scientific method" to the entrepreneurial process
  - Great early results

First-ever White House Maker Faire
(later this year)

• Growing movement to democratize the tools and skills to design and make just about anything.

• Can inspire students and adults to become entrepreneurs, pursue careers in design, advanced manufacturing and STEM.

• Event will be an opportunity to highlight both the remarkable stories of Makers like Joey Hudy, and commitments by leading organizations to help more students and entrepreneurs get involved in making things.

Launching an all-hands-on-deck effort to support Making

- A number of universities are already taking steps to give more students and adults ability to Make.
  - More spaces on campus (Georgia Tech's Invention studio; BU's new EPIC Studio, UC Berkeley's Jacobs Institute for Design Innovation)
  - Add a "Maker Portfolio" as part of admissions process (MIT).
  - Continue to innovate on the fabrication tools that Makers have available (ease of use; types of materials; variety/value of products)
  - Engineering students and alumni could serve as mentors
  - Open up more lab equipment/shared facilities

- Interested in getting involved? Email your thoughts, questions, or creations to maker@ostp.gov.

100KIN10
ANSWERING THE NATION'S CALL

• <u>Responding to President's call</u> in State of the Union to prepare 100,000 excellent STEM teachers over next 10 years.

• Led by *100kin10,* which was incubated by Carnegie, over <u>150 </u>other individual commitments to answer the call, collectively impacted over 40,000 STEM teachers.

• Includes funders that have collectively and committed over <u>$60M</u> in towards the goal.

AP Engineering Course

- Still in planning phase

- Important opportunity to add "E" to STEM, increase student awareness of engineering

- One of the few opportunities to have a national impact in a decentralized system

- Support from Engineering Deans is critical!

Graduating More Undergraduate Engineers

- <u>1 Million STEM Graduates Goal:</u> The President, based on a PCAST analysis, has called for producing one million additional college graduates with STEM degrees over the next decade. Fastest path is increased retention of undergraduates who intend to major in STEM, which is currently less than 40 percent, with a particular focus on the first two years.

- <u>PCAST's recommended steps to increase retention</u> include:
  - Overhauling uninspiring introductory courses, reducing reliance on lectures and introducing principles of active learning
  - Empowering more undergraduates to engage in research, engineering design, and real-world problem solving (on campus; industry internships).
  - increasing opportunities for women and underrepresented minorities

Growing Coalition in support of STEM Retention

- Growing community of universities, foundations and others focusing on retention.

  - Major commitments by the Helmsley Foundation ($30M)and HHMI ($65M) at President's College Opportunity Summit to increase retention of STEM students.

  - NSF partnership with GE and Intel ("Graduate 10K+") to make progress on increase retention of computer science and engineering students

  - Growing effort by leading engineering deans to catalogue best practices, including a meeting with President Obama.

  - Commitment by over 60 companies to double the number of undergraduate STEM internships they offer, especially to early years.

  - Increased focus on retention in NSF's undergraduate STEM programs

Build on growing momentum

- What can university leaders do?

  - Put undergraduate STEM education reform at the center of their capital campaign, and fund initiatives like the ones that Nobel Laureate Carl Wieman has led at the University of Colorado Boulder and the University of British Columbia

  - Collect and disseminate information about current STEM instructional practices on campuses

  - Increase the emphasis that teaching plays in recruiting, tenure and promotion

  - Organize high-profile workshops so that deans, department chairs, and faculty are familiar with the latest research – as recently summarized by the National Academy's report on Discipline-Based Education Research

Thank You

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