Protecting National Security
Innovation

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Assistant Director for Defense Programs
White House Office of Science and Technology Policy
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Outline

• OSTP: Who are we?
• Why Invest in S&T
• OSTP Initiatives to Support the Labs
• Questions
OSTP: two major responsibilities

1. Policy for Science and Technology
   Analysis, recommendations, and coordination with other White House offices on R&D budgets & related policies, S&T education and workforce issues, interagency S&T initiatives, broadband, open government, scientific integrity ...

2. Science and Technology for Policy
   Independent advice for the President about S&T germane to all policy issues with which he is concerned
More than 90 staff, many on loan from agencies, labs, universities, and NGOs.
OSTP is a part of the Executive Office of the President (EOP)
OSTP Mechanisms for Action

- Executive Orders
- NSTC*
- PCAST*
- WH staff processes
- Presidential Directives
- Collaboration with National Security Staff and others
- Budget process with OMB
- Convening power for interagency coordination

*National Science and Technology Council
*President’s Council of Advisors on Science and Technology
Innovation for National Security is a Presidential Priority

“Reaffirming America’s role as the global engine of scientific discovery and technological innovation has never been more critical ... Our renewed commitment to science and technology ... will help us protect our citizens and advance U.S. national security priorities.”

National Security Strategy, May 2010
President’s Strategy for American Innovation

Innovation for Sustainable Growth and Quality Jobs

Catalyze Breakthroughs for National Priorities

Spur Productive Entrepreneurship and Promote Efficiency

Invest in the Building Blocks of American Innovation

- Unleash a clean energy revolution
- Accelerate biotechnology, nanotechnology, and advanced manufacturing
- Educate Americans with 21st century skills and create a world-class workforce
- Strengthen and broaden American leadership in fundamental research

- Encourage high-growth and innovation-based entrepreneurship
- Promote innovative, open, and competitive markets

http://www.whitehouse.gov/innovation/strategy
Why Invest in S&T?

• Track record of past success
• Global competition
• Today’s technological opportunities
• Current threats require it
• Train the next generation
• Keep the engine running

Even in the face of shrinking or flat resources, there are compelling reasons to maintain or strengthen our investments in future capabilities through S&T
Track Record of Past Success

<table>
<thead>
<tr>
<th>40s</th>
<th>50s</th>
<th>60s</th>
<th>70s</th>
<th>80s</th>
<th>90s</th>
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<tbody>
<tr>
<td>Nuclear weapons</td>
<td>Digital computer</td>
<td>Satellite comm.</td>
<td>Airborne GMTI/SAR</td>
<td>GPS</td>
<td>Wideband networks</td>
<td>GIG</td>
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<td>Radar</td>
<td>ICBM</td>
<td>Integrated circuits</td>
<td>Stealth</td>
<td>UAVs</td>
<td>Web protocols</td>
<td>Armed UAVs</td>
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<td>Proximity fuse</td>
<td>Transistor</td>
<td>Phased-array radar</td>
<td>Strategic CMs</td>
<td>Night vision</td>
<td>Precision munitions</td>
<td>Optical SATCOM</td>
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<td>Sonar</td>
<td>Laser technology</td>
<td>Defense networks</td>
<td>IR search and track</td>
<td>Personal computing</td>
<td>Solid state radar</td>
<td>Data mining</td>
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<td>Jet engine</td>
<td>Nuclear propulsion</td>
<td>Space track network</td>
<td>Counter-stealth</td>
<td>Counter-stealth</td>
<td>Advanced seekers</td>
<td>Advanced seekers</td>
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<tr>
<td>LORAN</td>
<td>Digital comm.</td>
<td>Airborne surv.</td>
<td>Space track network</td>
<td>BMD hit-to-kill</td>
<td>Robotics</td>
<td>Decision support</td>
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<td></td>
<td></td>
<td>MIRV</td>
<td>C2 networks</td>
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Our competitors are investing

- Globalization of R&D and emerging centers-of-excellence around the world

698 billion yuan equals $108 billion U.S.
Source: China Science & Technology Statistics Data Book
Credit: Christina Baird/NPR

From NSF, Science and Engineering Indicators, 2010
Going...Going...Gone

Many high-tech products can no longer be manufactured in the United States because critical knowledge, skills, and suppliers of advanced materials, tools, production equipment, and components have been lost through outsourcing. Many other products are on the verge of the same fate.

**Semiconductors**
- **ALREADY LOST**
  - “Fabless” chips
- **AT RISK**
  - DRAMs
  - Flash memory chips

**Electronic displays**
- **ALREADY LOST**
  - LCDs for monitors, TVs, and handheld devices like mobile phones
  - Electrophoretic displays for Amazon’s Kindle e-reader and electronic signs
- **AT RISK**
  - Next-generation “electronic paper” displays for portable devices like e-readers, retail signs, and advertising displays

**Energy storage and green energy production**
- **ALREADY LOST**
  - Lithium-ion, lithium polymer, and NiMH batteries for cell phones, portable consumer electronics, laptops, and power tools
  - Advanced rechargeable batteries (NiMH, Li-ion) for hybrid vehicles
  - Crystalline and polycrystalline silicon solar cells, inverters, and power semiconductors for solar panels
- **AT RISK**
  - Thin-film solar cells (the newest solar-power technology)

**Computing and communications**
- **ALREADY LOST**
  - Desktop, notebook, and netbook PCs
  - Low-end servers
  - Hard disk drives
  - Consumer-networking gear such as routers, access points, and home set-top boxes
- **AT RISK**
  - Blade servers, midrange servers
  - Mobile handsets
  - Optical-communication components
  - Core network equipment

**Advanced materials**
- **ALREADY LOST**
  - Advanced composites used in sporting goods and other consumer gear
- **AT RISK**
  - Advanced ceramics
  - Integrated circuit packaging
  - Carbon composite components for aerospace and wind energy applications

*Taken from Gary Pisano and Willy Shih, “Restoring American Competitiveness”, Harvard Business Review, July-August 2009*
Emerging Technological Opportunities

• Nanotechnology
• Synthetic Biology
• Crowdsourcing
• Rapid prototyping
• Quantum Computing
• Robotics
• Artificial Intelligence
• Hypersonics
• Computational Materials Science
Today’s Threats Require S&T Solutions

- Cyber
- Anti Access/Area Denial
- Advanced missile technologies
- IEDs/RPGs
- Traumatic Brain Injury/PTSD
- CBRNE
- ...

15
STEM Doctoral Degrees Awarded to Foreign Students (2007)

- Physical Sciences: 46%
- Mathematics: 52%
- Computer Science: 57%
- Engineering: 63%

Office of Naval Research
“For decades the U.S. has commanded a decisive lead in the quality of defense-related research and engineering conducted globally and in the military capabilities of the products that flow from this work. However, the advantages, which have enabled American pre-eminence in defense technology, are not a birthright and they must be sustained.”
- Hon. Frank Kendall to SASC, 2011

S&T Ecosystem of Performers

US & Global S&T

Government S&T

Defense S&T

Industry (small)
- SBIR
- VC

Universities

Laboratories

Application Centers

Industry (large)
- Funded R&D
- IRAD

NGOs

- Health ?
- Quality ?
- Climate ?
**OSTP Lab Initiatives**

- Advocacy for world-class S&T in the Labs
  - Support for Current Operations/Warfighters
  - Smart Buyer Role
  - Sources of American Innovation

- Support for S&T in the Labs
  - In-House Funding (Section 219, basic research)
  - Infrastructure and Lab MILCON
  - Personnel
  - Customer Base
In-House Basic Research

Can the Services greatly increase capacity for in-house DOD laboratory basic research activities?

Intramural funding: flat and out of sync with growth in basic research program

Fiscal Year

DOD 6.1 Funding ($M)

Extramural

Intramural

ILIR = In-house Laboratory Independent Research
## Infrastructure Issues

<table>
<thead>
<tr>
<th>RDT&amp;E Only</th>
<th>TOTAL ft²</th>
<th>AVG ft²</th>
<th>AGE</th>
<th>AVG “Q” RATING</th>
<th>TOTAL PROPERTY REPLACEMENT VALUE (PRV)</th>
<th>FUNDING REQUIRED TO Q=100</th>
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<tbody>
<tr>
<td>Army</td>
<td>11,305,696</td>
<td>13,254</td>
<td>46</td>
<td>82</td>
<td>$3,791,002,023</td>
<td>$ 423,975,255</td>
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<tr>
<td>Navy</td>
<td>8,755,704</td>
<td>11,013</td>
<td>47</td>
<td>62</td>
<td>$3,071,485,923</td>
<td>$1,075,310,942</td>
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<tr>
<td>Air Force</td>
<td>15,392,265</td>
<td>22,243</td>
<td>40</td>
<td>92</td>
<td>$5,982,305,335</td>
<td>$ 472,479,755</td>
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<tr>
<td>Aggregate</td>
<td>35,453,665</td>
<td>15,151</td>
<td>44</td>
<td>78</td>
<td>$12,844,793,281</td>
<td>$1,971,765,953</td>
</tr>
</tbody>
</table>

Q = value grade (0-100) for the status of facility quality

Assessment of DOD RDTE facilities from DOD Report to Congress, “DOD Laboratory Recapitalization and Sustainment Issues”, June 2010

- Predominately BRAC and Congressional MILCON funding
- Minor MILCON authority (< $2 M)
- DOD LABCON account?
- Equipment Modernization and Upgrades?

What are the highest priority MILCON and equipment issues? How can they be addressed?
"The DoD lab S&E workforce age profile is not flat, owing to the fact that the DoD lab workforce lacks workers between 35 and 45 following the hiring freeze in the 1990s and worker turnover."

**Ideas**
- Protect 6.2
- Industry IPAs
- Streamlining Lab Personnel Processes
- Citizenship for Service
- Entrepreneurial Leave

Institute for Defense Analyses, June 2009
“Assessment of the DoD Laboratory Civilian Science and Engineering Workforce”
Customer Base and Outreach

Can we expand the customer base of the DOD labs to increase revenues and promote technology transfer?

- New Customers
  - Other Services
  - Other government agencies (NNSA, IC, DHS)
  - Industry
- New Partnerships
  - Lab to market
  - Public-private R&D

“Facilitate Commercialization through Local and Regional Partnerships. Agencies must take steps to enhance successful technology innovation networks by fostering increased Federal laboratory engagement with external partners, including universities, industry consortia, economic development entities, and State and local governments.”

Some Questions for the Future

• Does the Cold War national security R&D ecosystem need modifications?
• How do we ensure that the national security S&T enterprise is protected during times of budget pressure?
• How do we attract the best and brightest to work on national security problems?
• What is the role and future of DOD’s in-house laboratories?
“We now live in a world where technology has made it possible for companies to take their business anywhere. If we want them to start here and stay here and hire here, we have to be able to out-build and out-educate and out-innovate every other country on Earth.”

President Obama
September 8, 2011