Common Challenges & Shared Opportunities for the USA and Japan in Science, Technology, and Innovation

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National challenges linked to ST&I

- economic prosperity: ST&I as drivers (infotech, biotech, nanotech, advanced manufacturing...)
- health care: better outcomes for all at lower cost
- energy: affordable, reliable, & cleaner energy (including reduced use of oil & coal, less pollution)
- other resources & environment: water, land use, coastal zones, toxics, biodiversity, sustainability
- national & homeland security: cyber- & power-grid security, bio-defense, protecting nuclear materials from theft; detecting & disarming explosive devices

Global challenges linked to ST&I

- Health: Defeating preventable and pandemic disease
- Development: Eradicating poverty and providing the possibility of sustainable prosperity for all
- Energy-Climate: Providing for societies everywhere the energy their economies need without wrecking the climate their environments need
- Land-Water: Managing the intensifying competition for the world's land & fresh water among food, fiber, fuel, infrastructure/industry, and ecosystem function
- Oceans: Maintaining their ecological integrity & productivity
- WMD: Avoiding use of chem, bio, & nuclear weapons

President Obama recognizes that

- Meeting these global challenges is essential to US national well-being.
- Besides the interconnectedness of global and national challenges, the global challenges are interconnected with one another.
- ST&I are not just relevant to success with these interconnected challenges but central.

He also recognizes that

- Success requires not only applying ST&I to specific challenges, but also nurturing the foundations of strength in ST&I:
  - research universities & national labs;
  - other aspects of S&T infrastructure including broadband, high-speed computing, & space technology;
  - science, technology, engineering, and math (STEM) education;
  - economic and policy conditions conducive to entrepreneurship & innovation (financing, IPR, tax policy, trade policy, immigration policy…)

And he recognizes that:

- Because of…
  - the multifaceted character of the national and international challenges,
  - the connections among them, and
  - the need to maximize the resources brought to bear on them
- success will depend on the strengths of the partnerships we can build among:
  - federal agencies;
  - branches & levels of government;
  - public, private, & philanthropic sectors;
  - nations.

These views have been obvious in…

- the way President Obama has talked about ST&I to the country and the world;
- the number of distinguished scientists, engineers, and innovators he has appointed to leadership positions;
- the assignments and instructions he has given to the offices, agencies, and departments across the Executive Branch, and to PCAST; and
- the initiatives he has launched -- and the budgets he has provided for them – in the domains of ST&I, science & math education, and international S&T cooperation.

The centrality of ST&I: What do we need?

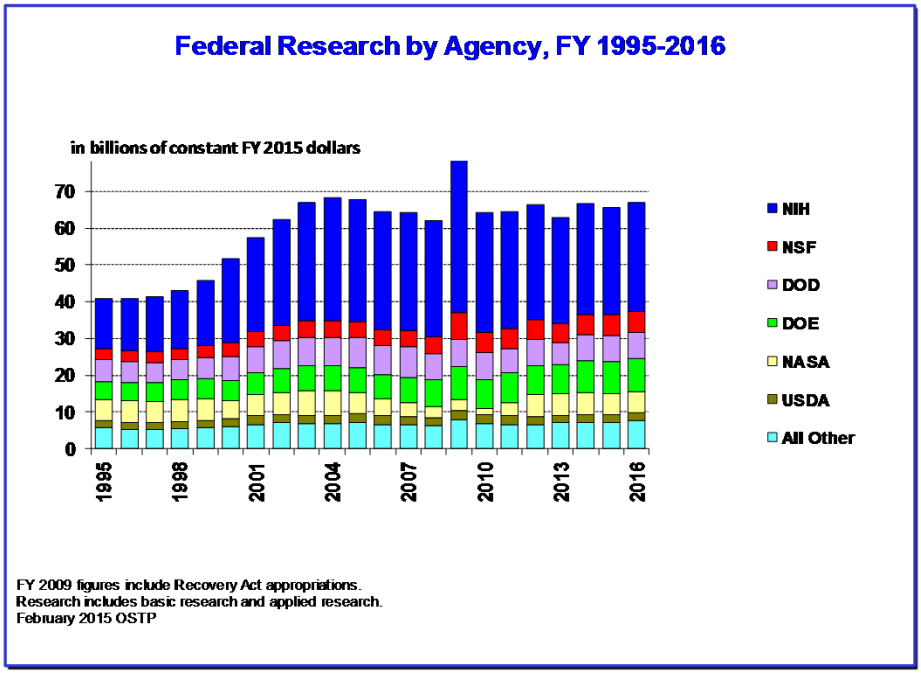
- The Economy: innovation that yields better manufacturing techniques, better products & services, and (thus) high-quality, sustainable jobs…
- Health: new IT tools for medical records, doctor-doctor & doctor-patient interaction; use of big data to personalize treatment; better, cheaper diagnostics; faster vaccine development & production; cancer therapies that target only cancer cells…
- Energy: better batteries, cheaper photovoltaic cells, lower-impact biofuels, CO_2 capture & sequestration, safer nuclear fuel cycles, fusion…

What we need from ST&I (continued)

- Agriculture: stress-tolerant crop varieties, livestock resistance to disease, farmer access to knowledge & markets through IT…
- Climate Change: better monitoring in-situ & from space; better models on faster computers; regional disaggregation of impacts to support adaptation; better scientific communication for public understanding…
- National & Homeland Security: better detection of conventional & nuclear explosives and of clandestine weapons facilities; faster identification of & response to bio-threats; better defenses against cyber-threats…

R&D in the President's FY16 Budget

Budget authority in billions of current dollars	FY14 actual	FY15 actual	FY16 POTUS	Change FY15-16
Total R&D	136.3	138.1	145.7	5.5%
defense	*71.0*	*72.2*	*76.9*	*6.5%*
nondefense	*65.4*	*65.8*	*68.8*	*4.5%*
Research	64.7	64.8	66.9	3.2%
defense	*9.8*	*10.0*	*9.8*	*-2.1%*
nondefense	*54.9*	*54.8*	*57.1*	*4.1%*
Development	69.0	70.7	76.0	7.5%
defense	*60.8*	*62.0*	*66.7*	*7.6%*
nondefense	*8.2*	*8.7*	*9.3*	*6.7%*



US initiatives: energy & environment

- $80 billion for clean & efficient energy in ARRA
- funding for Advanced Research Projects Agency – Energy (ARPA-E) and six new Energy Innovation Hubs
- first-ever fuel-economy/CO2 tailpipe standards for light-duty vehicles, plus fuel-economy standards for trucks
- US Global Change Research Program reinvigorated, with $2.7 billion proposed for FY2016 (9.1% increase).
- Interagency task force led by OSTP, CEQ, NOAA on coordination of government's adaptation activities
- New National Oceans Policy & National Oceans Council
- Blueprint for a Secure Energy Future (March 2011)
- Climate Action Plan (June 2013)

The President's Climate Action Plan

- Cutting carbon pollution in America

  cutting CO_2 from power plants; promoting renewable energy & other cleaner energy options; increasing fuel-economy standards; cutting energy waste in buildings & industry; reducing emissions of HFCs and methane; managing forests for C sequestration

- Preparing the USA for the impacts of climate change

  directing agencies to support climate-resilient investment; establishing national task force on climate preparedness; managing flood, drought, & wildfire risks; mobilizing science & data for climate resilience

- Leading international efforts on global climate change

  enhancing bilateral & multilateral engagement on mitigation & adaptation; mobilizing clean-energy & preparedness finance

More initiatives: biomedicine & public health

COMBATTING ANTIBIOTIC-RESISTANT BACTERIA (CARB)

- PCAST Report, Executive Order, and Strategic Plan (2014)
- Goals of National Action Plan (2015):
  - Slow emergence and spread of resistant bacteria
  - Strengthen national One-Health surveillance
  - Expand research on diagnostics, antibiotics, new therapeutics, and vaccines and accelerate their implementation
  - Improve international collaboration and capacity for prevention, surveillance, management, and research on antibiotic resistance
- The President's FY16 budget proposes doubling support for antibiotic-resistance research and management to $1.2 billion

Biomedicine & public health (continued)

PRECISION MEDICINE -- An approach to medical care that uses big data to account for individuals' characteristics in treatment

- **Cancer genomics** – advance basic science, diagnostics, and treatment (particularly pediatric cancers); $70 million in FY16 budget
- **National Cohort** – 1 million volunteers whose health records, genome sequences, microbiome profiles, and other relevant data will be analyzed to predict each person's health trajectory, disease, treatment, and responses to drugs; $130 million in FY16 budget
- **Reimbursement** – redesign to reinforce value, not volume; $5 million in FY16 budget
- **Regulation** – regulation should enable innovation while protecting public safety; $10 million in FY16 budget

More initiatives: infotech & innovation

- Presidential Innovation Fellows: cohorts of 18-36 IT superstars come to DC for 6-12 months to work in teams on IT-linked innovation challenges
- Open Government : web-based public participation
- ConnectED: $2B from FCC, $1B+ from private sector to provide broadband access & computers for classrooms
- Big Data: managing & manipulating large datasets for new insights and applications
- Data.gov: making gov't datasets available in support of innovation, entrepreneurship
- National Strategic Computing Initiative: accelerating arrival & application of capable exascale computers

Partnerships with the private sector

- Firms fund 67% of US R&D, perform 72%. (Making research tax credit permanent will help with this.)
- Recovery Act helped start & grow clean-energy businesses across the country.
- Small Business Innovation Research (SBIR) initiative provides innovation funding from diverse agencies
- Small business lending bill (signed 9-27-10) increases loans & cuts taxes for entrepreneurs.
- DOE's energy-innovation hubs link national labs, universities, and industry.
- Start-Up America Initiative promotes entrepreneurship, transfer of tech from lab to market.
- NASA/private-sector partnerships are making access to space more affordable.

SpaceX Corporation's Dragon capsule docks w the ISS, May 2012

The US space program under Obama

In addition to advancing the role of competition in the private sector to carry cargo and crew to low Earth orbit, under President Obama NASA has…

- Extended the life of the International Space Station to at least 2020 (and proposed extension to 2024)
- Increased investments in the advanced technologies needed to extend human space exploration beyond the Moon (propulsion, habitation, radiation shielding…)
- Devised an innovative asteroid-retrieval mission to advance multiple goals
- Continued development of a new heavy-lift rocket and multipurpose crew capsule on a scale & schedule consistent with mission needs.

Space science in Obama's NASA

- NASA under Obama has spent ~$120B through FY15, nearly $40B of it for cutting-edge science
- This funding has
  - launched a mission to Jupiter
  - landed a fourth rover ("Curiosity") on Mars
  - continued 14 planetary missions (Mercury, Saturn, Pluto…)
  - operated 20 missions to study Sun and its effects on Earth
  - maintained 21 astrophysics missions
- FY14 alone saw 5 Earth Science missions
- Exoplanet search to continue w new mission in 2017
- James Webb Space Telescope is on track for 2018

Self-portrait of the Curiosity rover on the surface of Mars

Incentives for international cooperation in S&T

- Globalization of R&D spending & capabilities
- High cost of extending frontiers of knowledge
  - high-energy physics
  - astronomy & astrophysics
  - Earth observation
  - robotic & human space exploration
  - fusion energy & carbon capture/storage/utilization
- Global challenges
  - poverty / development
  - global health
  - energy / climate
  - food / water

Dimensions of US international S&T cooperation

US strategy for innovation & competitiveness

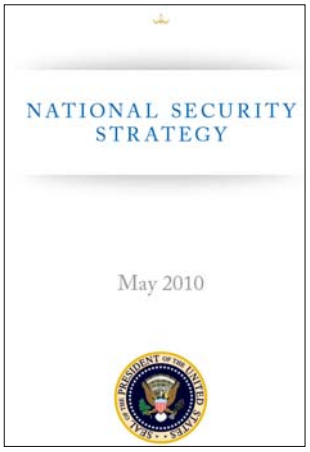
- S&T cooperation can share costs & risks of RD&D, access specialized expertise, accelerate progress, provide understanding of and access to foreign markets

US global-development strategy

- Presidential Policy Directive on Global Development (Sept 22, 2010)
- Global Health, Feed the Future, Global Climate Change initiatives
- USAID's increasingly ST&I-based approach

US national-security and international diplomacy strategy

- S&T cooperation as pillar and glue in important bilateral relationships
- defense- and homeland-security technology cooperation with and assistance to allies
- global development as an increasingly explicit part of national-security policy as well as international-diplomacy efforts, with ST&I center stage



Mentions of	Obama	Bush
"science"	25	1
"international cooperation"	9	3
"education"	32	2
"partnership"	45	7

III. ADVANCING OUR INTERESTS

Expand International Science Partnerships: America's scientific leadership has always been widely admired around the world, and we must continue to expand cooperation and partnership in science and technology. We have launched a number of Science Envoys around the globe and are promoting stronger relationships between American scientists, universities, and researchers and their counterparts abroad. We will reestablish a commitment to science and technology in our foreign assistance efforts and develop a strategy for international science and national security.

International cooperation: Obama initiatives

- Reviving & strengthening the high-level Joint Commission Meetings on S&T cooperation with India, China, Brazil, Japan, S Korea, Russia
- Nurturing the strong S&T cooperation that has long existed with the EU, Canada, Australia, NZ…
- Convening the Multilateral Economic Forum,, US-China S&ED, US-India S&CD – all with strong ST&I focus
- Streamlining the visa procedures that apply to visiting scientists & technologists
- ST&I as a centerpiece of June 2009 Cairo speech (Science Envoys, centers of excellence) & USAID strategy

Internat'l cooperation: initiatives (continued)

Presidential Policy Directive on Global Development (September 2010)

- Global Climate Change Initiative

  clean energy, sustainable landscapes, resilience & adaptation

- Global Food Security Initiative

  Global Agriculture & Food Security Program, Feed the Future

- Global Health Initiative

  strengthening health systems; focus on maternal & child health, family planning, nutrition, infectious diseases, neglected tropical diseases

US-Japan ST&I cooperation: History

- 1960s
  - SCIENCE: US-Japan Committee on Scientific Dialogue leading to the US-Japan Cooperative Science Program
  - NATURAL RESOURCES: US-Japan Cooperative Program in Natural Resources
  - MEDICINE: US-Japan Cooperative Medical Science Program
- 1970s and 1980s
  - ENVIRONMENT: US-Japan Agreement in Cooperation in Environmental Protection
  - S&T COOPERATION: US-Japan Science and Technology Agreement—1980, expanded in 1988, extended in 2014
- 1993—US-Japan Common Agenda (Clinton-Miyazawa)

21st-century US-Japan ST&I cooperation

- CROSS-CUTTING
  - Joint Working-Level Committee Meeting (JWLC) (last held 2014)
  - Joint High-Level Committee Meeting (JHLC) (last held 2013)
  - Science in Japan Forum (launched 2005)
  - Memorandum of Understanding (MOU) for Cooperation on Research and Development in support of Technical Standards (2014)
- HEALTH
  - US-Japan Vaccine Policy Exchange (VPE), held annually since 2010
  - US-Japan Brain Research Cooperative Program—Japan participates in White House Brain Initiative (2000)
  - NIH-National Cancer Center—MOU on Cooperation in Cancer Research (2014)
  - NIH-Japan-JSPS Symposium on Frontiers of Biomedical Science (2013)

21st-century cooperation (continued)

- SPACE
  - US-Japan Comprehensive Dialogue on Space (2013)
  - US-Japan Civil Space Dialogue (2014)
  - NASA-JAXA Cooperation on International Space Station (Ongoing)
  - NASA-JAXA Global Precipitation Measurement Mission (2014)
- EARTH AND OCEAN OBSERVATIONS
  - NOAA-JAMSTEC collaborations for over 20 years in ocean observing, ocean climate, oceanography, and ocean exploration.
  - NSF-MEXT Cooperation on the Integrated Ocean Discovery Program (2013)
  - NOAA-JAXA Cooperation on Global Climate Observation Mission-Water (2012)

21st century cooperation (continued)

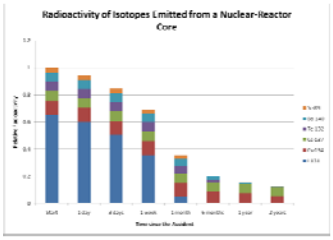
- ENERGY
  - US-Japan Energy Dialogues (starting 2011)
  - US-Japan Collaborative Smart Grid Project (2012)
  - US-Japan Renewable Energy Business Roundtable (2012, 2013)
  - Okinawa-Hawaii Partnership on Clean and Efficient Energy Development and Deployment (2010)
  - DOE-METI Memorandum of Cooperation on Carbon Capture and Storage (2015)
- CIVIL NUCLEAR
  - Bilateral Commission on Civil Nuclear Cooperation (2012)
  - Nuclear Security Working Group (2011)
  - Cooperation in the Field of Research and Development of Innovative Nuclear Energy Technologies (2013)
  - Cooperation on Fukushima Recovery (2013…P

21st century cooperation (continued)

- HIGH ENERGY PHYSICS
  - DOE-MEXT Collaboration on Accelerator R&D (2013)
  - Potential collaboration on International Linear Collider
- ENVIRONMENT
  - EPA – Environment Ministry Cooperation Agreement (2015)
  - US-Japan Natural Resources Panel on Aquaculture (2014)
- DISASTER RESPONSE
  - Bilateral Commission on Nuclear Decontamination (2011)
  - Fukushima Daiichi Collaboration Agreement (2013)
  - US-Japan Big Data and Disaster Research (2014)
  - NSF-MEXT E-Defense Collaborative Earthquake Research Program (2005)

Disaster response: Fukushima Daiichi

- OSTP reconciliation and interpretation of DOE, NRC, EPA, NOAA analyses for the President, National Security Council Staff, White House Communications
- Technical advice to the Japanese through the ad hoc Chu-Holdren experts panel
- After-action activities to inform future responses in crises of national interest



21st century cooperation (continued)

- INFORMATION TECHNOLOGY, CYBER
  - Policy Cooperation Dialogue on the Internet Economy (2014)
  - Cyber Dialogue (2015)
  - DOE-MEXT collaboration on High Performance Computing and Software (2014)
  - MOU on Cloud Computing and Network Security (2012)
- ROBOTICS
  - Japanese teams in DARPA Robotics Challenge
  - DoD-METI TOR for Robotics Cooperation in Humanitarian Assistance and Disaster Recovery (2013)
- EDUCATIONAL EXCHANGES
  - NIH-JSPS Fellowship for post-docs
  - NSF-JSPS graduate student exchanges

21st century cooperation: Obama/Abe era

JOINT HIGH LEVEL COMMITTEE ON S&T COOPERATION

- 12th ministerial-level Joint High-Level Committee (JHLC) Meeting held in Washington DC in 2013
- Agreements were reached to…
  - —Continue to reaffirm the importance of human resource development and research exchanges
  - —Exchange lessons learned on emergency management and communications
  - —Enhance cooperation in R&D related in energy and related fields
  - —Continue to work together to develop critical and advanced materials

Obama/Abe era of cooperation (continued)

- May 2015 visit of PM Abe to Washington DC
  - —Agreement to expand cooperation on biomedical research, robotics, advanced materials, information science & technology, cyber security
  - —Agreement to continue cooperation on space-based positioning & navigation, space situational awareness,
  - —Agreement that Japan will host the Second International Space Exploration Forum (ISEF) in 2016 or 2017 (following U.S. hosting of 1st ISEF in January 2015).

Obama/Abe era of cooperation (continued)

- 13th JHLC Meeting to be held in Tokyo, Oct 6, 2015
- Agenda includes…
  - —Science, technology, & innovation policies in the USA and Japan: comparisons & best practices
  - —Biomedical research & health: cooperation in neuroscience, genomic medicine, medical technology, clinical trials, big data for precision medicine
  - —Data science: internet of things, artificial intelligence, cybersecurity, high-performance computing
  - —Energy science & technology: MEXT-DOE and METI-DOE Implementing Agreements, clean energy, high-energy physics

Barriers to realizing cooperation's potential

- "Stove-piping" in relevant departments & agencies on both sides
- Bureaucratic obstacles to travel and joint work (visas, clearances)
- Intellectual property issues
- Opposition to cooperation by legislators who don't understand its benefits
- Finding adequate funding in a time of constrained budgets.

A key to overcoming the barriers is…

… knowledgeable & committed leaders.

Thank you!

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