NIST Update
Visiting Committee on Advanced Technology

Walter G. Copan
Under Secretary of Commerce for Standards and Technology
and NIST Director

NIST
National Institute of Standards and Technology
U.S. Department of Commerce

NIST Update

- Agenda Review
- New VCAT Members
- Budget Update
- Recent NIST Highlights
- Security Update
- Equity in Career Advancement Update
- International Engagements
- Recent Awards

Meeting Agenda

June 4, 2019

Session I: NIST Update

Session II: Administration's Priorities for Science and Technology

Session III: NIST Strategic Plan – Positioning NIST for a Changing S&T Environment

Session IV: Update on NIST Activities in Emerging Technologies

Session V: Update on NIST Lab-to-Market Activities

June 5, 2019

Session VI: Neutron Science - APS Perspectives & NCNR Overview

Welcome New Members

Dr. Vinton G. Cerf

Vice President and Chief Internet Evangelist, Google
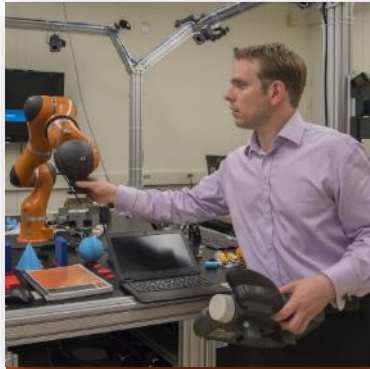
VCAT member (2007-2013)

Dr. Mehmood Khan

Chief Executive Officer, Life Biosciences

Dr. Eric Kaler

President, University of Minnesota

Programmatic Priorities

Advanced Manufacturing

Cybersecurity & Privacy

Disaster Resilience

© Matt DeLorme
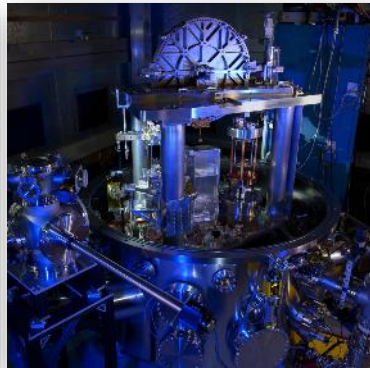
Engineering Biology

Internet of Things

Documentary Standards
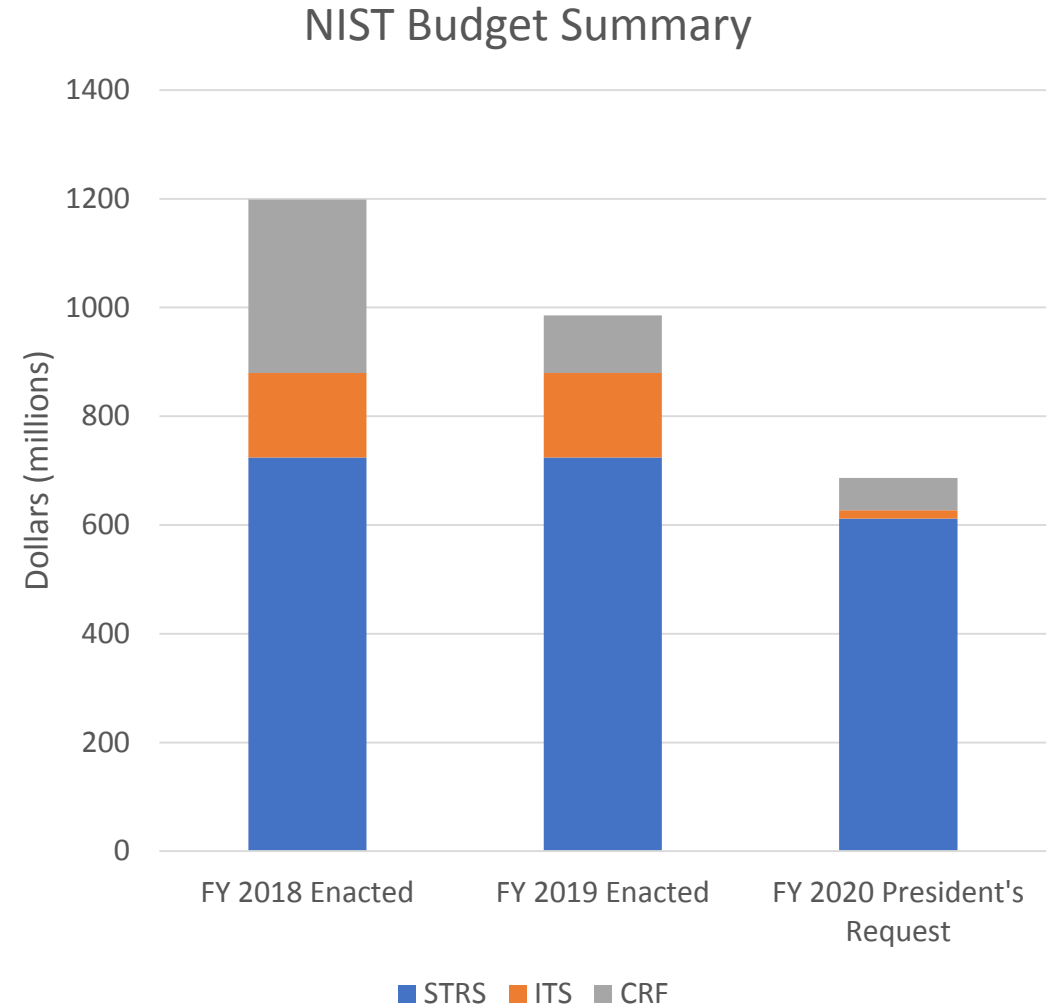
Technology Transfer

Measurement Dissemination

Quantum Science

Artificial Intelligence

NIST

The President's FY 2020 Budget:

- Prioritizes NIST's core measurement science mission

- Prioritizes support for NIST's role in quantum science, artificial intelligence, and microelectronics-related R&D

- Eliminates funding for MEP

- Supports NIST's Boulder Building 1 project (through the GSA Federal Capital Revolving Fund)
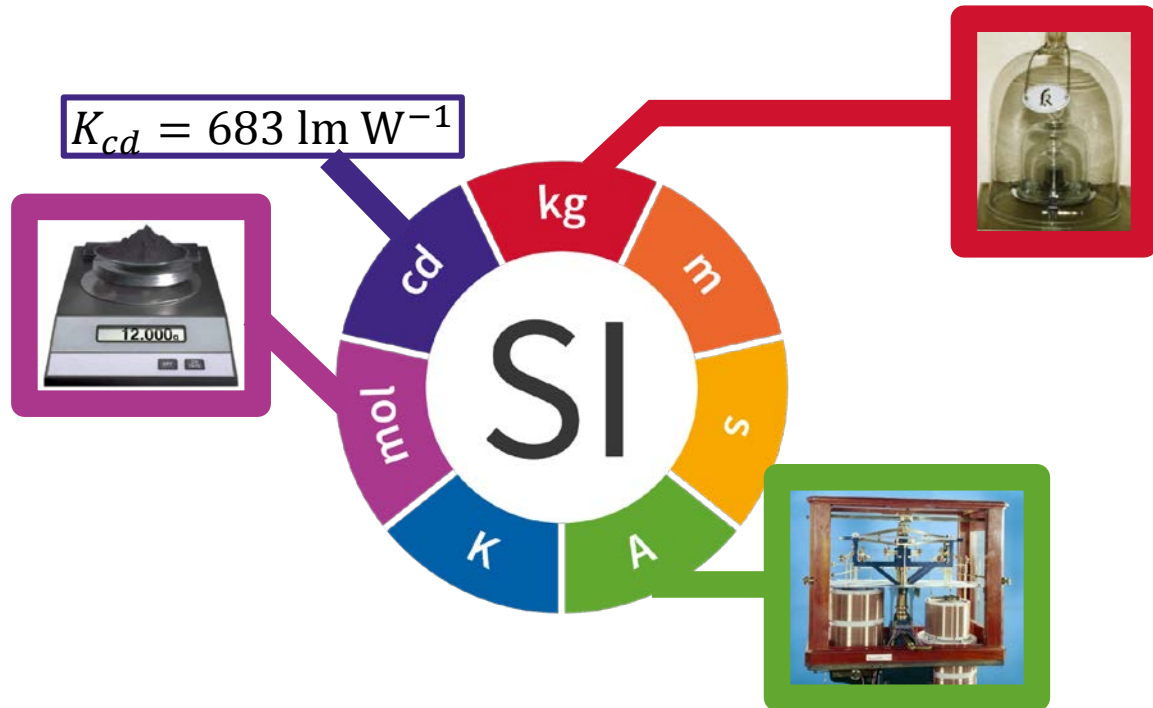
NIST Budget Summary

Stacked bar chart titled "NIST Budget Summary". Y-axis: Dollars (millions), 0 to 1400. Categories (X-axis): FY 2018 Enacted, FY 2019 Enacted, FY 2020 President's Request. Legend: STRS (blue), ITS (orange), CRF (gray).

NIST BUDGET

	FY 2017 Enacted	FY 2018 Enacted	FY 2019 Enacted	FY 2020 Pres. Request	FY 2020 House Mark	FY 2020 Senate Mark
Laboratory Programs (STRS)	$690.0	$724.5	$724.5	$611.7	$751.0	NA
Hollings Mfg Ext Partnership (MEP)	$128.0	$140.0	$140.0	$0.0	$154.0	NA
Manufacturing USA	$25.0	$15.0	$15.0	$15.2	$15.2	NA
Construction & Renovation	$109.0	$319.0	$106.0	$59.9	$120.0	NA
Total	**$952.0**	**$1,198.5**	**$985.5**	**$686.8**	**$1,040.2**	**NA**

Measurement Dissemination: Redefinition of the SI

- Two weeks ago (5/20/19) all SI units became based on fundamental standards

- Four of the seven base units changed due to replacement of the artifactual kg

$$K_{cd} = 683 \text{ lm W}^{-1}$$

NIST colloquium May 17, 2019 featuring NIST's Jon Pratt

(photo credit J. Stoughton for NIST)

ROI Final Green Paper


- **Green Paper** published **April 24, 2019** as NIST Special Publication 1234

- 15 key findings to inform actions to modernize U.S. technology transfer legislation, policy and practice

- Thanks to VCAT Subcommittee on Technology Transfer

- Detailed discussion session later today - June 4, 2019

- Charter for VCAT Subcommittee: Next Steps

Tech Transfer: NIST on a Chip

NIST
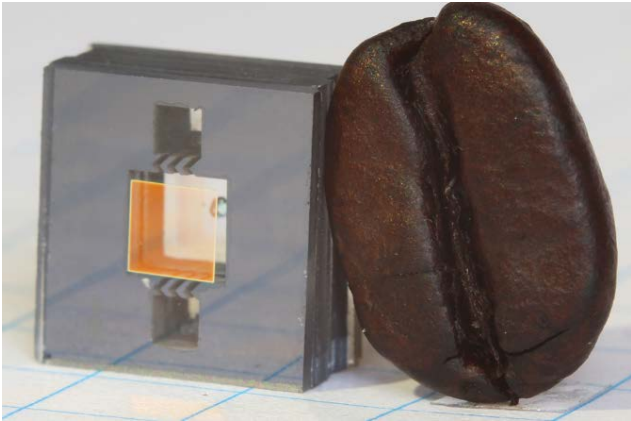
Next-Generation Atomic Clock

- Smaller than a coffee bean
- Vapor cell on a chip contains rubidium atoms
- Patent submitted
- Designed for manufacturability
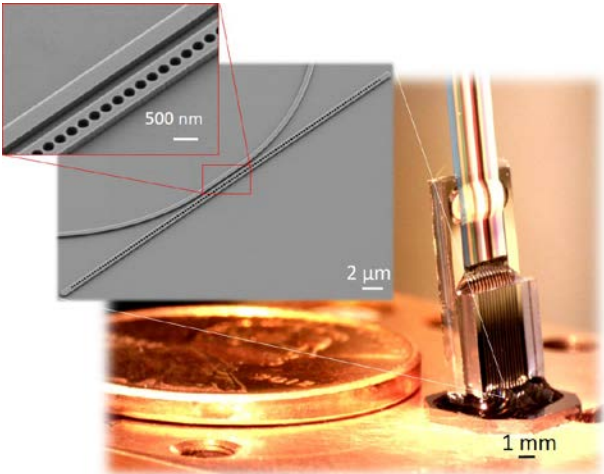
Chip-Scale Photonic Thermometer

- Uses optical properties of materials to measure changes in temperature
- In joint development with an industry partner

2 CRADAs and partnerships - begun **execution**

4 New CRADAs and partnerships - in **discussions** with companies

4 Partnerships in discussion with **other agencies**

2 **Working prototypes** demonstrated

Advanced Manufacturing: Standards for Wearable Robotics

NIST leads an ASTM F48 standards committee on exoskeleton task performance

NIST is developing tests to determine how well the exoskeleton conforms to humans

Replication of NIST's test methods is underway by at least 9 organizations

Advanced Manufacturing: Using AI to Solve Industry's Robot Challenges

Agile Robotics for Industrial Automation Competition (ARIAC)

Calls on the community to solve real robot challenges faced by industry, with the goal of enabling industrial robots on the shop floors to be more productive, more autonomous, and to require less time from shop floor workers

- ARIAC 2019 offers $17,500 in prizes to teams from academia and industry

- Participants develop a robot control system (software) to control a robot in a simulated environment

- Co-sponsors have included ABB Robotics, Dassault Systemes, IEEE, and Siemens

New IEEE Standards Study Group formed to develop robot agility test methods and standards, includes ARIAC participants

Advanced Manufacturing: Manufacturing USA

Mike Molnar testified in House Science Hearing "Revitalizing American Leadership in Advanced Manufacturing" (March 26, 2019)

Advanced Manufacturing identified by the White House as one of four *Industries of the Future* to fuel prosperity

15th Manufacturing USA Competition Active – DOE Cybersecurity Institute for Energy Efficient Manufacturing

March 6th visit of NIH Director Francis Collins and U.S. Senator Chris Coons to University of Delaware included NIIMBL Center Director Kelvin Lee (left)

Advanced Manufacturing: MEP

NIST

New report:

## The National-Level Economic Impact of the Manufacturing Extension Partnership (MEP): Estimates for Fiscal Year 2018

Prepared by W. E. Upjohn Institute (issued May 10, 2019)

Forecast	Jobs	GDP	Output	Personal Income	Returns to Treasury	ROI Return on Investment
Constrained Model Using Firm Variables	236,802	$24.9*	$46.6*	$15.0*	$2.02*	14.4:1

* Dollars in billions

Engineering Biology: NIST Genome Editing Workshop May 3, 2019

Other
4%

Academia
8%

Federal Gov.
26%

Industry
62%

110 ATTENDEES
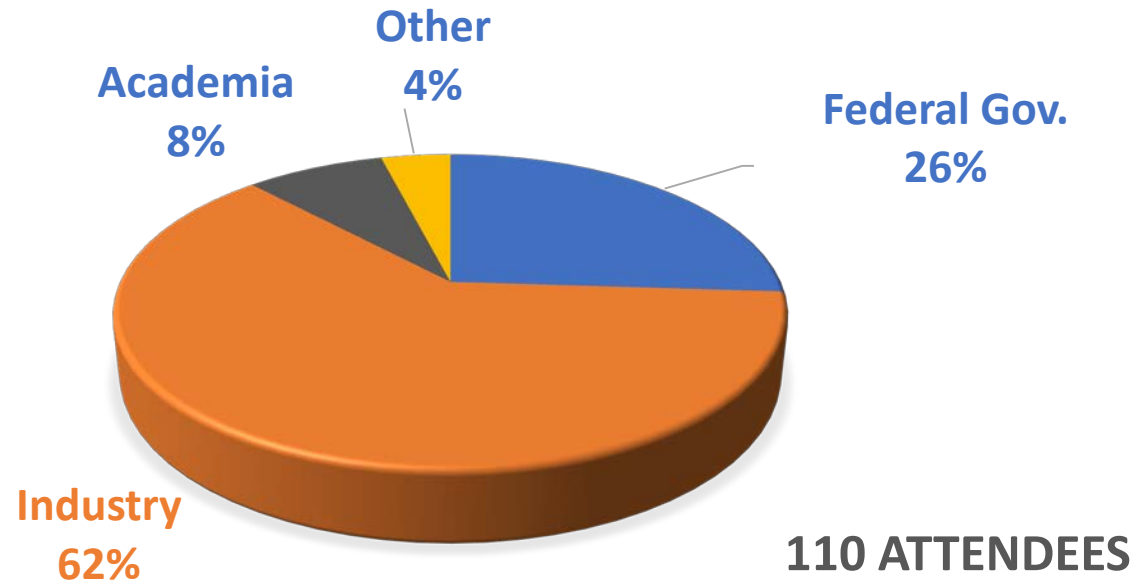
1. Coordinated recent federal investments and efforts (NIST, NIH, DARPA, FDA)

2. Shared recent measurement and technology innovations as well as challenges

3. Refined work plans to develop precompetitive measurement solutions (31+ consortium members)

4. Agreed to leverage NIST Genome in a Bottle standards and data

NOVARTIS

Agilent Technologies

NEW ENGLAND BioLabs

IDT INTEGRATED DNA TECHNOLOGIES

ASC Applied StemCell

macrogen Humanizing Genomics

aldevron

KromaTiD

ThermoFisher SCIENTIFIC

illumina

CRISPR THERAPEUTICS

AstraZeneca

horizon INSPIRED CELL SOLUTIONS

bluebirdbio

Intellia THERAPEUTICS

editas MEDICINE

St. Jude Children's Research Hospital

Dow DUPONT CORTEVA agriscience

SYNTHEGO

BIO-RAD

PRECISION BIOSCIENCES

mission bio

CARIBOU BIOSCIENCES

Lonza

MGH MASSACHUSETTS GENERAL HOSPITAL

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Advanced Communications: 5G Efforts

NIST Public Safety Innovation Accelerator Program awardee: Spectronn

- Spectronn developed a "mobile edge-computing-in-a-box" system
- Multi-networking technology funded by NIST allows public safety to have reliable data streams
- Technology implemented for the Brookline, MA police department during the 2019 Boston Marathon (April 15)

175+ participants in NIST 5G mmWave Channel Model Alliance (Intel, Nokia, Qualcomm, Facebook, etc.)
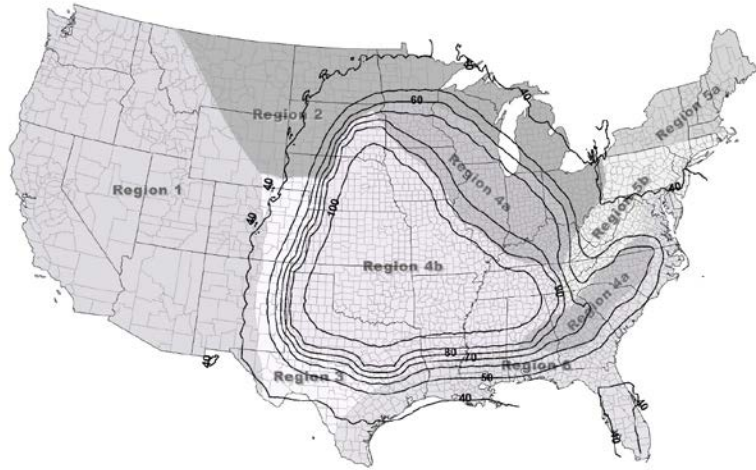
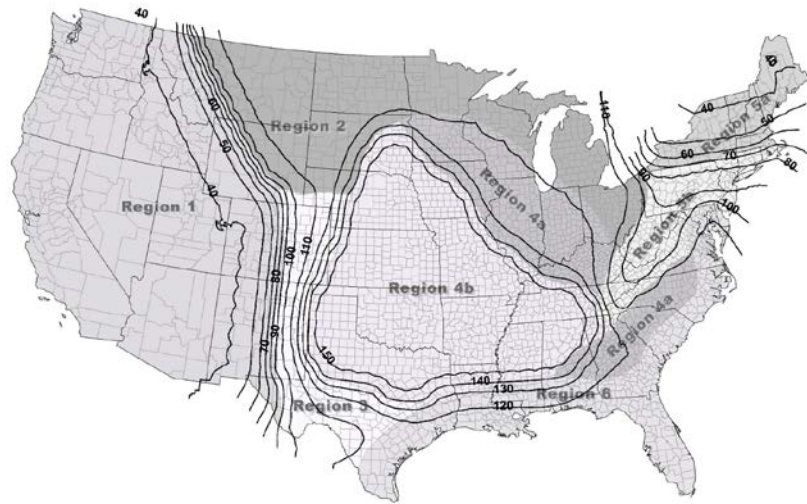NIST's 5G and Beyond program is providing industry with robust metrology tools and data

Active engagement with other agencies and the private sector on 5G standards

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Resilience: Tornado Hazard Maps

Point Target
06_Kriging_sm_ave_1DegS_subregion_3000yr

4,000,000 SF Target Area
06_Kriging_sm_ave_1DegS_subregion_3000yr

NIST developed first-of-a-kind probabalistic tornado maps for the contiguous United States

Maps will enable development of national standards and codes for tornado resistant buildings

Proposed for incorporation into next edition of American Society of Civil Engineers standards (ASCE 7)

Resilience: Response to Hurricane Maria
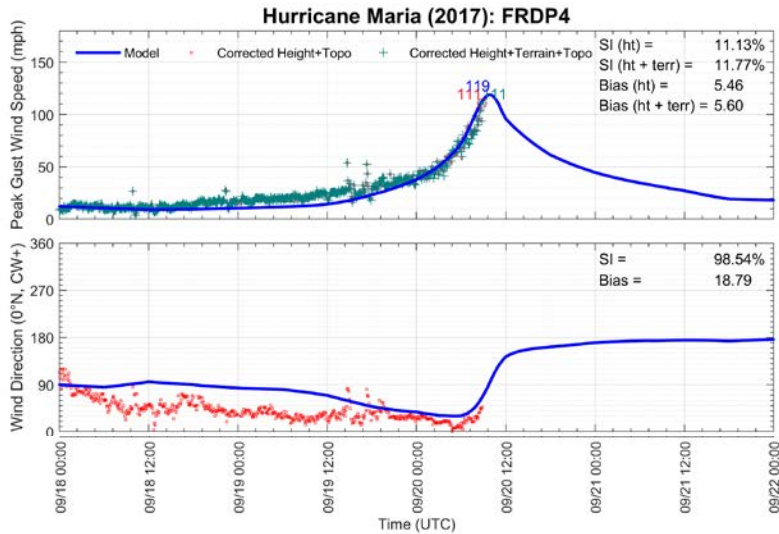
NIST developed a hurricane vortex model to fit Maria's track

- Model shows peak wind gusts over 200 mph in some regions
- Model's hazard characterization used by six other technical projects in the NIST Hurricane Maria Program
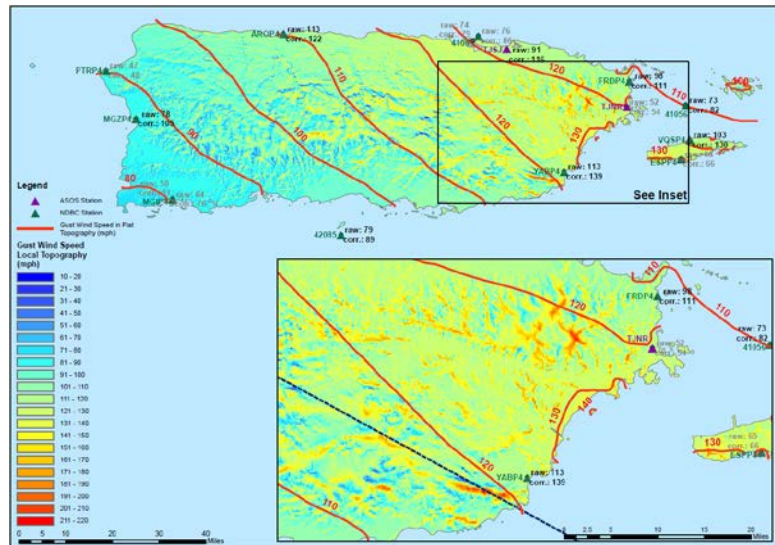
Also: NIST MEP - Funding and support for Puerto Rico business recovery

Cybersecurity and Privacy: Post Quantum Cryptographic Standards

26 Algorithms Advancing to the Post-Quantum Crypto 'Semifinals'

2nd Phase of evaluation and review now in progress, will last 12-18 months

Cybersecurity and Privacy: Publications

NIST

Privacy Framework
- RFI Summary Analysis & Privacy Framework Outline (2.27.2019)
- Privacy Framework Discussion Draft (4.30.2019)

Cybersecurity Framework
- Roadmap for Cybersecurity Framework Version 1.1 (4.25.2019)

Cybersecurity for IoT
- Released Considerations for a Core IoT Cybersecurity Capabilities Baseline discussion draft for public comment (2.4.2019)

Artificial Intelligence Standards

NIST

February 11, 2019 Executive Order: *Maintaining American Leadership in Artificial Intelligence*

- NIST developing a Plan for Federal Engagement in AI Standards, pursuant to Executive Order

- Request for Information and Public Workshop to solicit input for plan
  - NIST AI standards event May 30, 2019

- Session on AI later today

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Science and Security: Context

- NIST engages in a wide variety of ways with domestic and international partners
  - International engagement is a core function of NIST, as described in the *NIST Organic Act* (15 USC 272)
  - To stay at the forefront in S&T, this engagement is crucial
- In order to do this safely, we must
  - Take the threat of academic espionage seriously
  - Have policies and procedures in place to vet foreign nationals and follow relevant DOC/State Department policies
- For each visiting researcher, senior leadership balances engagement benefit against risk

Science and Security: NIST Actions

Front of the door
Card Reader

- Begin installation of cyberlocks restricting access to labs and offices this fiscal year
- Foreign National Request Form to be made compliant with DOC policy
- PIV cards to be scanned electronically at all entrance gates (Gaithersburg)
- Consistent policies for escorts for contractors (at sites of new/refurbished buildings)
- Policy for Denial of Access to be instituted
- Security Assessments of both Boulder and Gaithersburg to be done

*Invited Speaker Dr. Freeman A. Hrabowski, III (President, UMBC)
at the first NIST Inclusivity Summit, held April 30th
for all managers and supervisors*

Some of the Efforts Underway:

Diversity, Inclusivity and Equity Conversations
- From top leadership to all parts of NIST, inclusivity is part of our conversations

External Assessment
- Analysis of Equity Disparity in NIST STEM Career Advancement – *Procurement underway*

Graduate Student Measurement Science and Engineering (GMSE) Fellowship Program
- Administered through a grant with National Physical Science Consortium

NIST International Engagements

Leadership roles:

Jim Olthoff elected as Vice President of CIPM (International Committee of Weights and Measures)

- Influencing worldwide uniformity in measurements

Claire Saundry elected as President of SIM (Regional Metrology Group for the Americas)

- Steering Inter-American measurement infrastructure

Engagement opportunities:

- Standards, ICT and cybersecurity expertise supporting US trade discussions (EC, UK)

- Shaping outcomes of the G20 digital economy and G7 ICT workstreams:
  - Cybersecurity
  - AI
  - Standards
  - Innovation
  - Data flows and privacy

White House OSTP 🔵 @WHOSTP · May 15
That's a wrap on #G7Digital! #TeamUSA is proud to represent the values and ideals of our great Nation on the international stage alongside our important @G7 partners. Together, we will unleash the benefits and potential of the Industries of the Future. On to the #OECDForum!

Standards and Related Developments

2019 NIST - ANSI Memorandum of Understanding

- First signed in 1995

- Affirms NIST and ANSI's respective roles

- Private-public partnership nature of US standards system

Raising awareness of strategic importance of standards for the nation

- Emerging tech (e.g. 5G, AI, etc.)
  - Policymaker engagement with the White House and on Capitol Hill

- Innovation and competitiveness
  - Standards Essential Patents(SEP) policies - balancing rights of licensors and licensees

ANSI CEO Joe Bhatia and NIST Director Copan signing the ANSI-NIST MOU. April 29, 2019

Quantum Information Science

- NIST represented at the White House Academic Roundtable on Innovation in Quantum Information Science - May 31, 2019
- Participants included NIST Joint Institute academic partners in QIS
  - JILA: University of Colorado – Boulder
  - JQI / QuICS: University of Maryland
- NIST / SRI Quantum Economic Development Consortium – 60+ corporate members

With former NIST Director Willie May, Morgan State University Preparing the future quantum workforce

NIST Realignment – Background

- Competitive global economy of 21st century: New challenges for U.S.A. and NIST
- Economic competitiveness ⟶ National security
- NIST must visibly fulfill the Agency's national responsibilities
  - U.S. leadership for Metrology, Standards & Technology
  - Advanced Manufacturing
  - Technology transfer policy development and implementation government-wide

- ADLP as Principal Deputy to the NIST Director will elevate standards policy, NIST international leadership role, facilitate cross-cutting interdisciplinary research & development, with enduring focus on innovation.

- Foster development of human capital, cultivate our talent pipeline for diversity and a culture of inclusivity, integrate our strategic planning NIST-wide, and maximize synergies for organizational effectiveness

NIST Realignment – 2019

New:

- Director Technology Transfer: NIST internal and national technology transfer programs
- Chief Human Capital Officer: Integrated support for NIST Federal employees & Associates
- Director Strategy and Policy: Incorporating Program Coordination Office

Realigned:

- International and Academic Affairs – ADLP
- Human Subjects Protection Office – ADLP
- Onboarding Office – Human Capital
- Associates Support - Integrated NIST-wide with Human Capital
- Technology Discovery Office - Technology Transfer

- Public Affairs – Unifying NIST branding

NIST Organization 2020

National Technical Information Service (NTIS)

NIST Director / Under Secretary of Commerce for Standards and Technology

Office of Chief Counsel

Office of Policy & Strategic Planning

Associate Director for Laboratory Programs (ADLP)

Associate Director of Innovation and Industry Services (ADIIS)

Associate Director of Management Resources (ADMR)

Chief of Staff

Laboratory Programs
Communications Technology Laboratory
Engineering Laboratory
Information Technology Laboratory
Material Measurement Laboratory
NIST Center for Neutron Research
Physical Measurement Laboratory
    Center for Nanoscale Science and Technology
Human Subjects Protection
Standards Coordination
International and Academic Affairs
Special Programs Office

Innovation and Industry Services
Baldrige Performance Excellence Program
Hollings Manufacturing Extension Partnership
Office of Advanced Manufacturing
Technology Transfer
    Technology Discovery Office

Management Resources
Human Capital
    Onboarding
Acquisition and Agreements Management
Safety, Health and Environment
Financial Resource Management
Information Systems Management
Facilities and Property Management

Civil Rights and Diversity
Information Services
Emergency Services
Fabrication Technology

Executive Officer for Administration
Management and Organization Office
Public Affairs
Congressional and Legislative Affairs

*Main changes shown in colored font

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Recent Awards

Impressive accomplishments across NIST

Too many to fit here

Congratulations all!
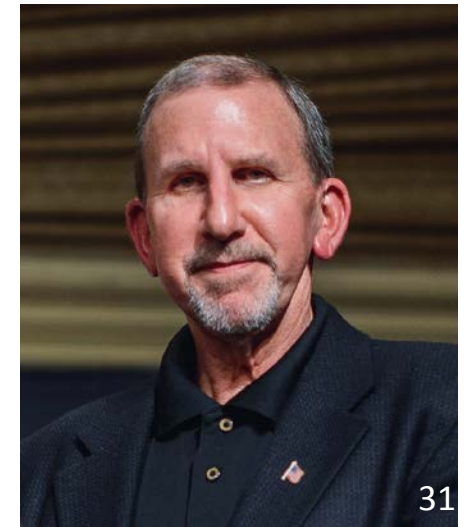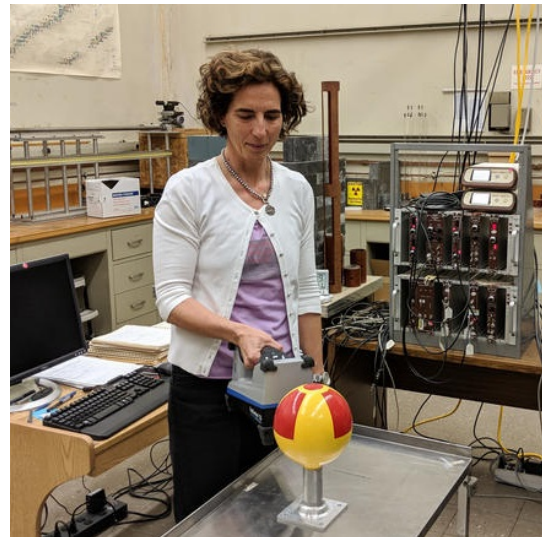
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DISCUSSION