

# NIST Update

## Visiting Committee on Advanced Technology

**Walter G. Copan**

Under Secretary of Commerce for Standards and Technology  
and NIST Director

# Meeting Agenda



**Session I: NIST Update**

Session II: Setting the Stage – The Role of NIST in America’s Evolving Innovation Ecosystem

Session III: Steps Taken and Future Opportunities

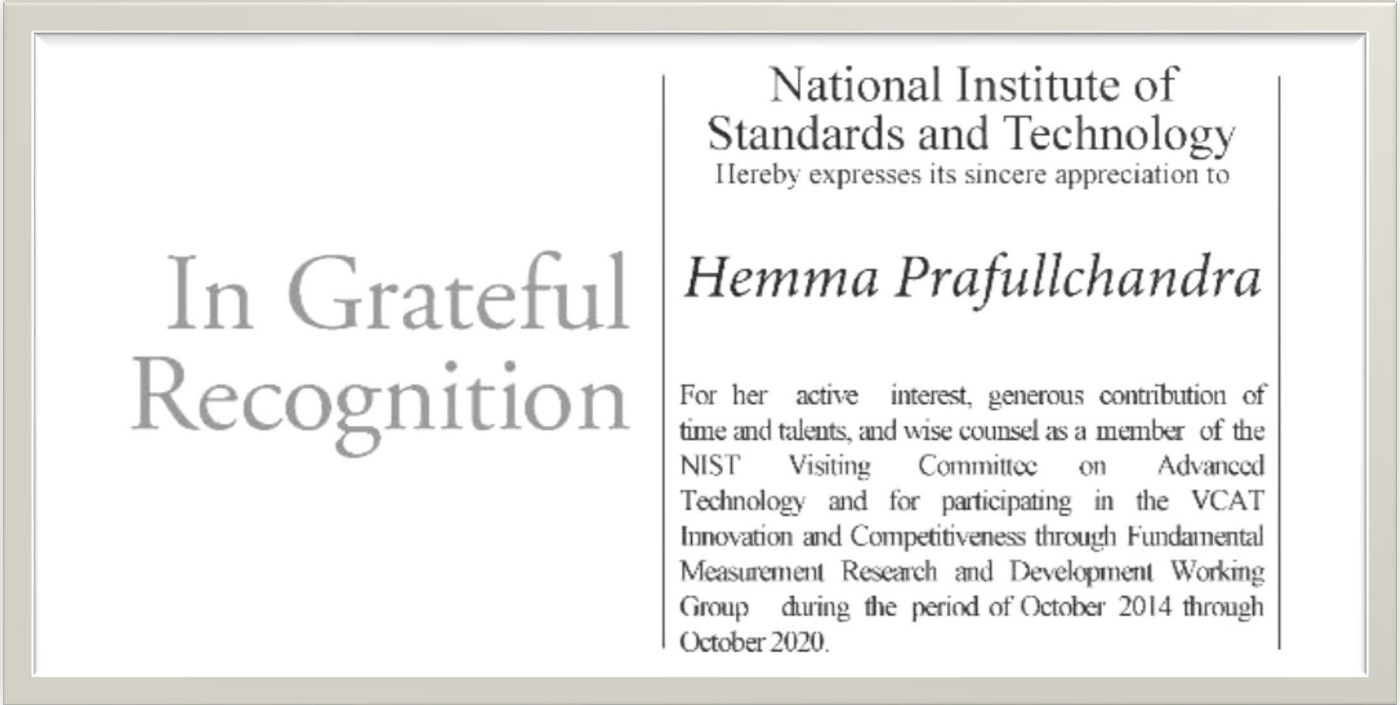
Session IV: Discussion with VCAT

- Thank You and farewell to two VCAT Members
- NIST leadership changes
- Budget update
- Laboratories programmatic update
- Discussion

# Thank You



CTO Microsoft M365 Security & Compliance



# Thank You



President and CEO  
M-7 Technologies

## In Grateful Recognition

National Institute of  
Standards and Technology  
Hereby expresses its sincere appreciation to

*Michael Garvey*

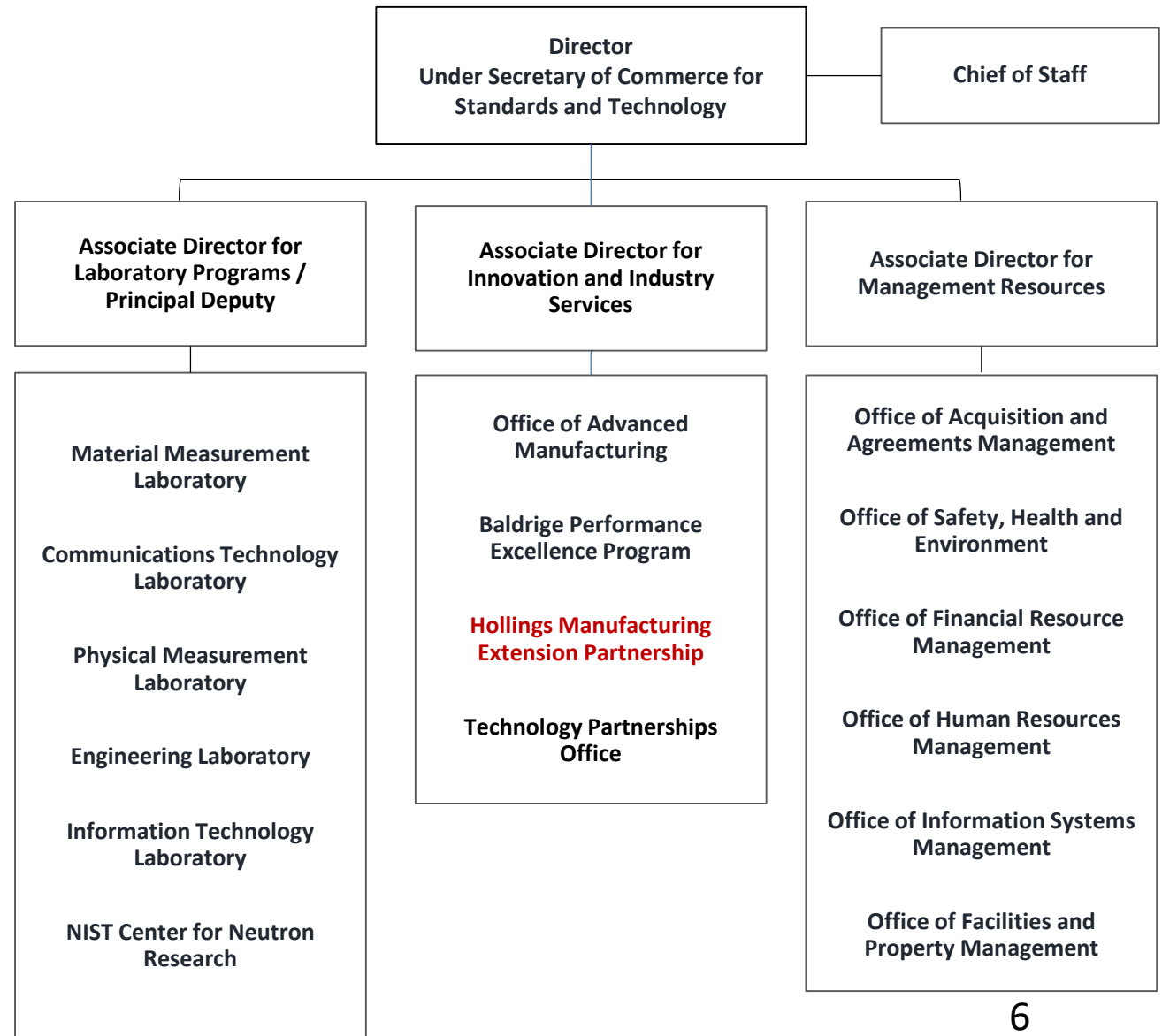
For his active interest, generous contribution of time and talents, and wise counsel as a member of the NIST Visiting Committee on Advanced Technology and for participating in the VCAT Communications Working Group during the period of January 2015 through January 2021.

# NIST Leadership Changes: Retirement

## Director, Hollings Manufacturing Extension Partnership (MEP)

### Carroll Thomas

- Retiring in December 2020
- Nearly **18 years at NIST** as Senior Program Office Analyst, Commerce/Science Fellow, Partnership Catalyst and MEP Director
- More than 30 years of entrepreneurial and small business development experience
- Served as Acting Associate Director of Innovation and Industry Services (ADIIS)
- Provided senior leadership for the NIST Office of Advanced Manufacturing, Baldrige Performance Excellence Program and the Technology Partnerships Office

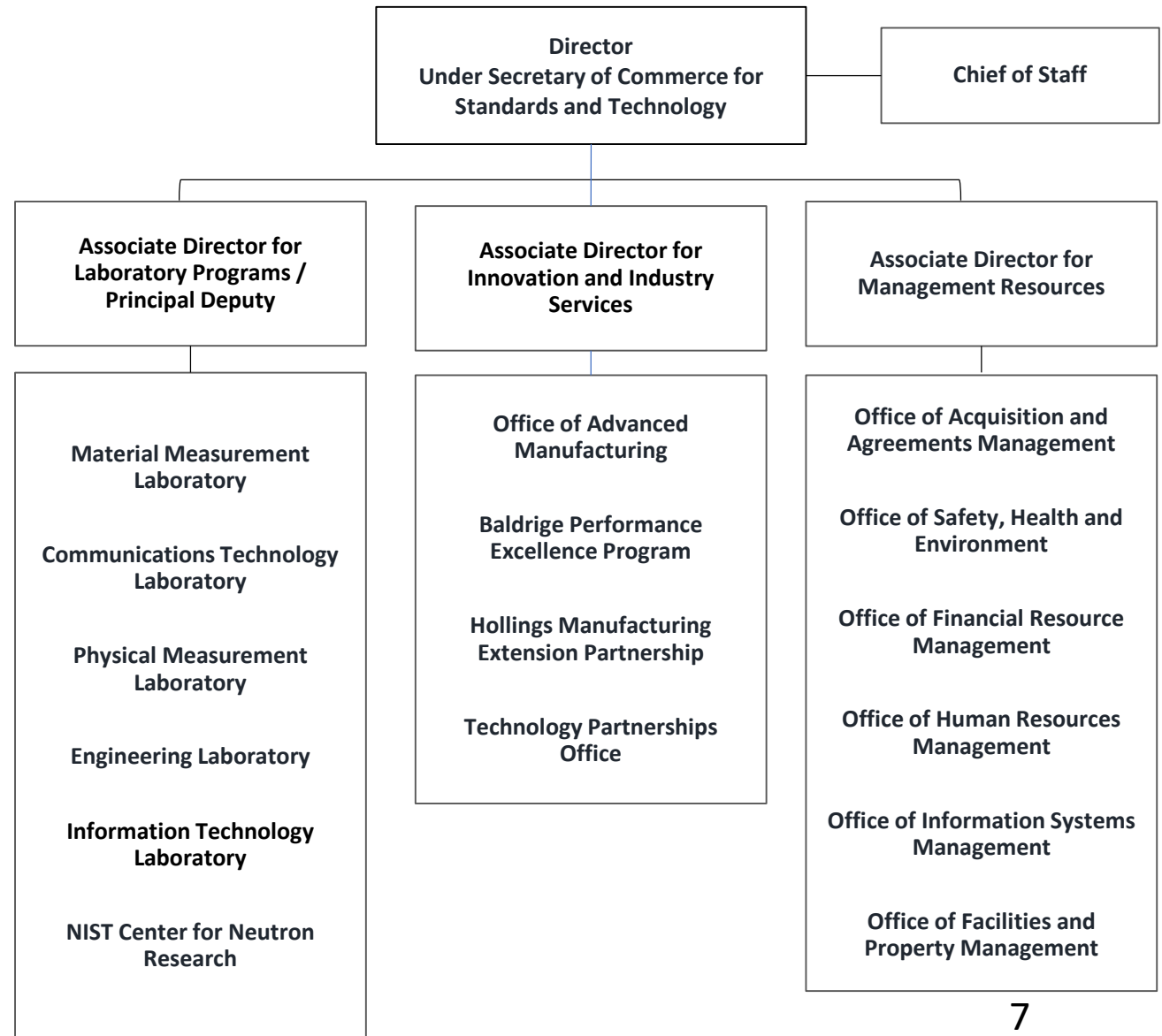


# NIST Leadership Changes: Retirement

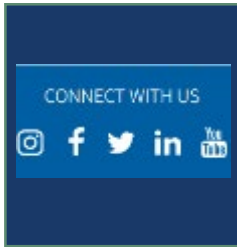
## Director, Public Affairs Office

### Gail Porter

- Retired September 2020 after **33 years at NIST**
- Leadership in programs for media relations, Web content development and production, social media, video production, internal communications, general publications, conference and audiovisual services, and public inquiries
- Led PAO team to four Emmy awards in 2020! Total **five Emmys** received by NIST staff since 2018



# NIST Leadership Changes



## Jennifer Huergo

Acting Director,  
Public Affairs Office



## Rob Ivester

Acting Director, Hollings  
Manufacturing Extension  
Partnership (MEP)





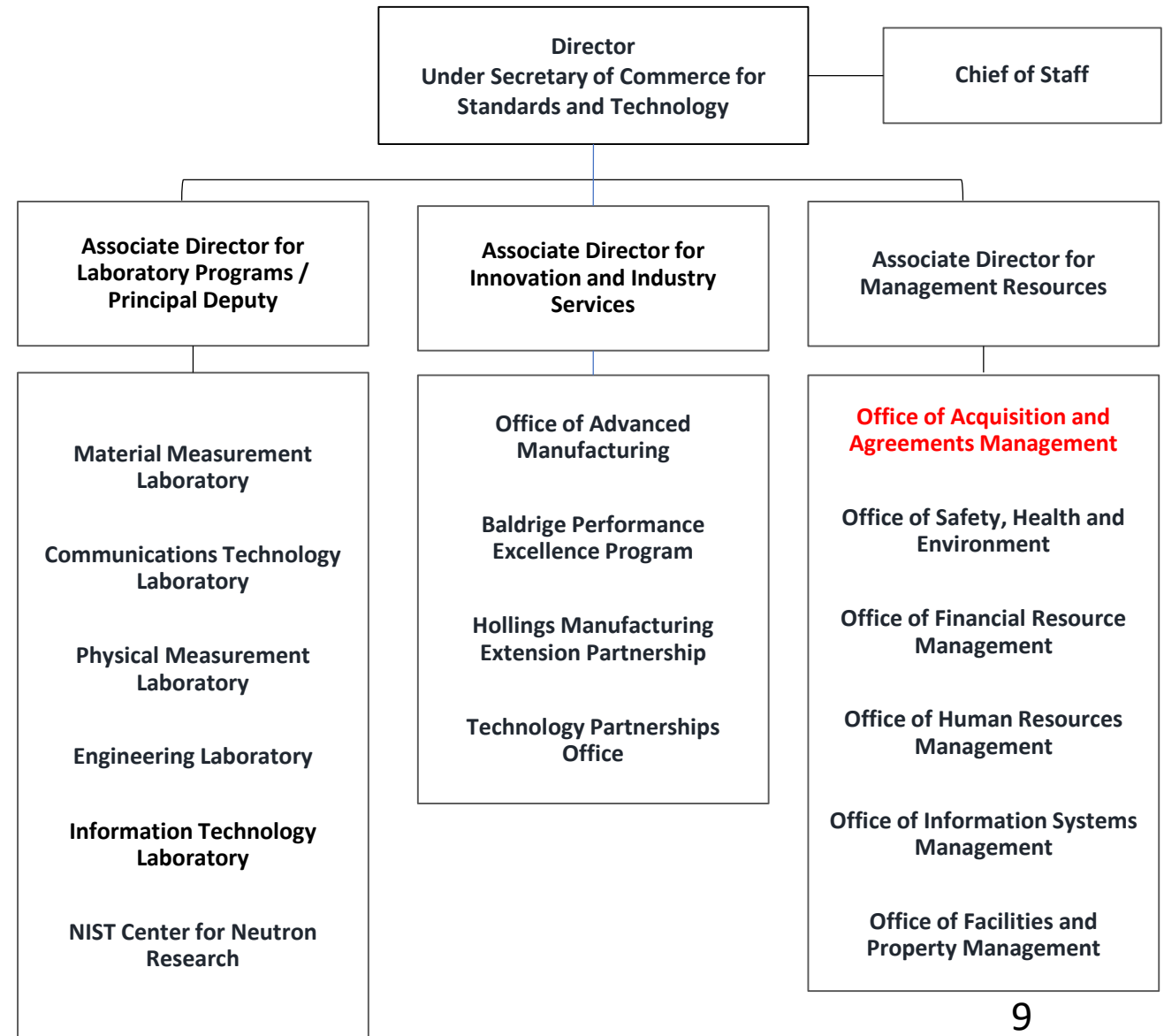
# NIST Leadership Changes: Welcome



## Director, Office of Acquisition and Agreements Management

### Stephen Yuter

- Previously served as Senior Vice President and Public Sector Contracts Leader with global PR firm FleishmanHillard.
- Senior Manager and Chief Contracts Strategist with Deloitte and Director of Capture Strategy with Red Team Consulting.
- Has held senior acquisition and contracting leadership positions at HHS, HUD, USDA, DHS, and DoD, and served as source selection authority for over \$10 B of contracts.



NIST is operating under, planning for, and developing budgets for three fiscal years

**FY21**

Continuing Resolution

**FY22**

In Development

**FY23**

Early Stages

# NIST Budget



	FY 2020 Enacted	FY 2020 CARES Act P.L. 116-136	FY 2021 Request	FY 2021 House Mark
<b>STRS</b>	<b>\$754.0</b>	<b>\$6.0</b>	<b>\$652.0</b>	<b>\$789.0</b>
Laboratory Programs	655.8	6.0	591.3	TBD
Corporate Services	17.3	0.0	12.0	TBD
Stds Coord & Special Pgms *	80.9	0.0	48.7	TBD
<b>ITS</b>	<b>\$162.0</b>	<b>\$60.0</b>	<b>\$25.3</b>	<b>\$170.0</b>
Hollings Mfg Ext Partnership	146.0	50.0	0.0	153.0
Manufacturing USA	16.0	10.0	25.3	17.0
<b>CRF</b>	<b>\$118.0</b>	<b>\$0.0</b>	<b>\$60.2</b>	<b>\$85.0</b>
Construc & Major Renovations	43.0	0.0	19.6	10.0
Saf, Cap, Maint & Maj Repairs	75.0	0.0	40.6	75.0
<b>Total, NIST Discretionary</b>	<b>1,034.0</b>	<b>66.0</b>	<b>737.5</b>	<b>1,044.0</b>

\* Includes \$2.2M Baldrige Performance Excellence Program funding.

# Updates on Inclusivity



Image credit: NSB

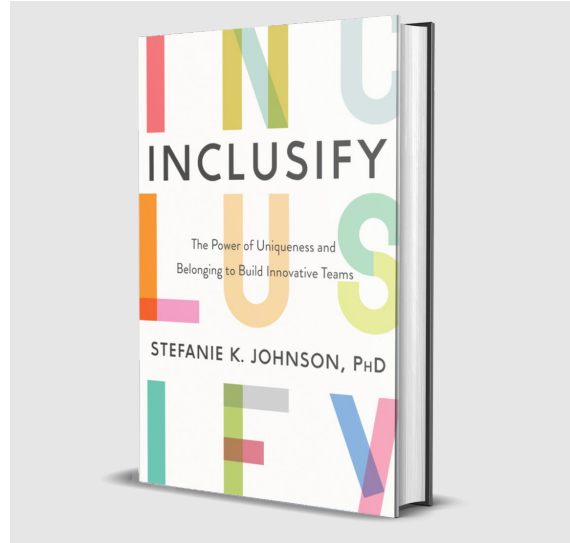


Image credit: inclusifybook.com

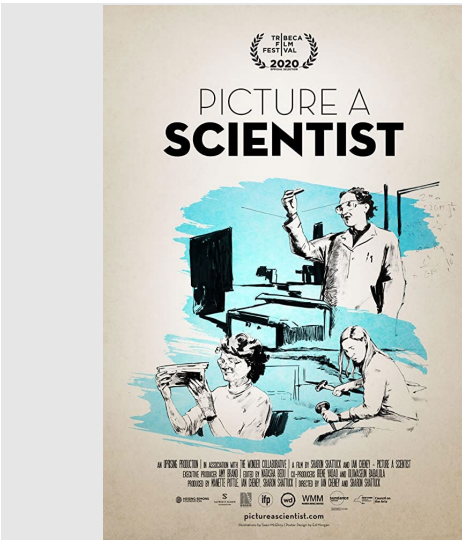


Image credit: Picture a Scientist



Image credit: NASA

- **Film Screening** of *Picture a Scientist* and discussion sessions hosted by WiSTEM with NIST Ombuds
- Ongoing **COACH** study of inequity in promotion – focus groups this month and next
- Conclusion of two **staff detail** assignments looking at inclusivity at NIST
- NIST **Colloquium** featuring Prof. Stefanie K. Johnson on the ABCs of Breaking Bias
- National **Hispanic Heritage Month** celebration with Dr. Ellen Ochoa
- **Inclusivity in Standards** NIST Workshop
- **Inclusivity Showcase** featuring NIST groups and efforts in diversity, equity, and inclusion (Oct 27)
- Creation of new NIST-wide position: **Director** of Diversity and Inclusion (in progress)

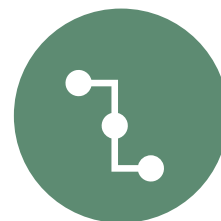
# Privacy Framework



Credit: Shutterstock



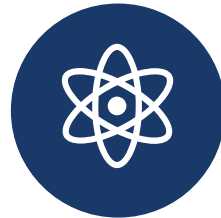
“Growing a Workforce for Managing Privacy Risk” Workshop was hosted by International Association of Privacy Professionals on Sept. 22-24, 2020



GDPR Crosswalk by Enterprivacy Consulting Group  
ISO/IEC 27701 Crosswalk by Microsoft



Credit: E. Edwards/JQI



**Post Quantum Cryptography**  
Round Three Selections completed



**Lightweight Encryption**  
The Fourth Lightweight Cryptography  
Workshop (virtual) on October 19-21,  
2020



SP 800-53 Rev 5  
Security and Privacy Controls  
for Information Systems and  
Organizations



Draft Workforce Framework  
for Cybersecurity (NICE  
Framework)



Cybersecurity Telework  
Resource Page



SP 800-207  
Zero Trust Architectures



Began validating cryptographic  
modules to FIPS 140-3, Security  
Requirements for Cryptographic  
Modules



SP 800-211  
Cybersecurity Program Annual  
Report

# Responsible Use of Positioning, Navigation, and Timing Services (PNT)

EXECUTIVE ORDERS

## Executive Order on Strengthening National Resilience through Responsible Use of Positioning, Navigation, and Timing Services

— INFRASTRUCTURE & TECHNOLOGY | Issued on: February 12, 2020



The Executive Order directs the Department of Commerce and other agencies to work with the private sector to identify and promote responsible methods of using PNT services that appropriately manage risks.

The Department of Commerce is also charged with making a global navigation satellite system (GNSS)-independent source of Coordinated Universal Time to enhance the resilience of and support the needs of critical infrastructure



Using an open and collaborative process, NIST will develop a foundational PNT profile to help organizations make deliberate, risk-informed decisions on their use of PNT services and will offer a time service over optical fiber lines as an alternate source of precision time.



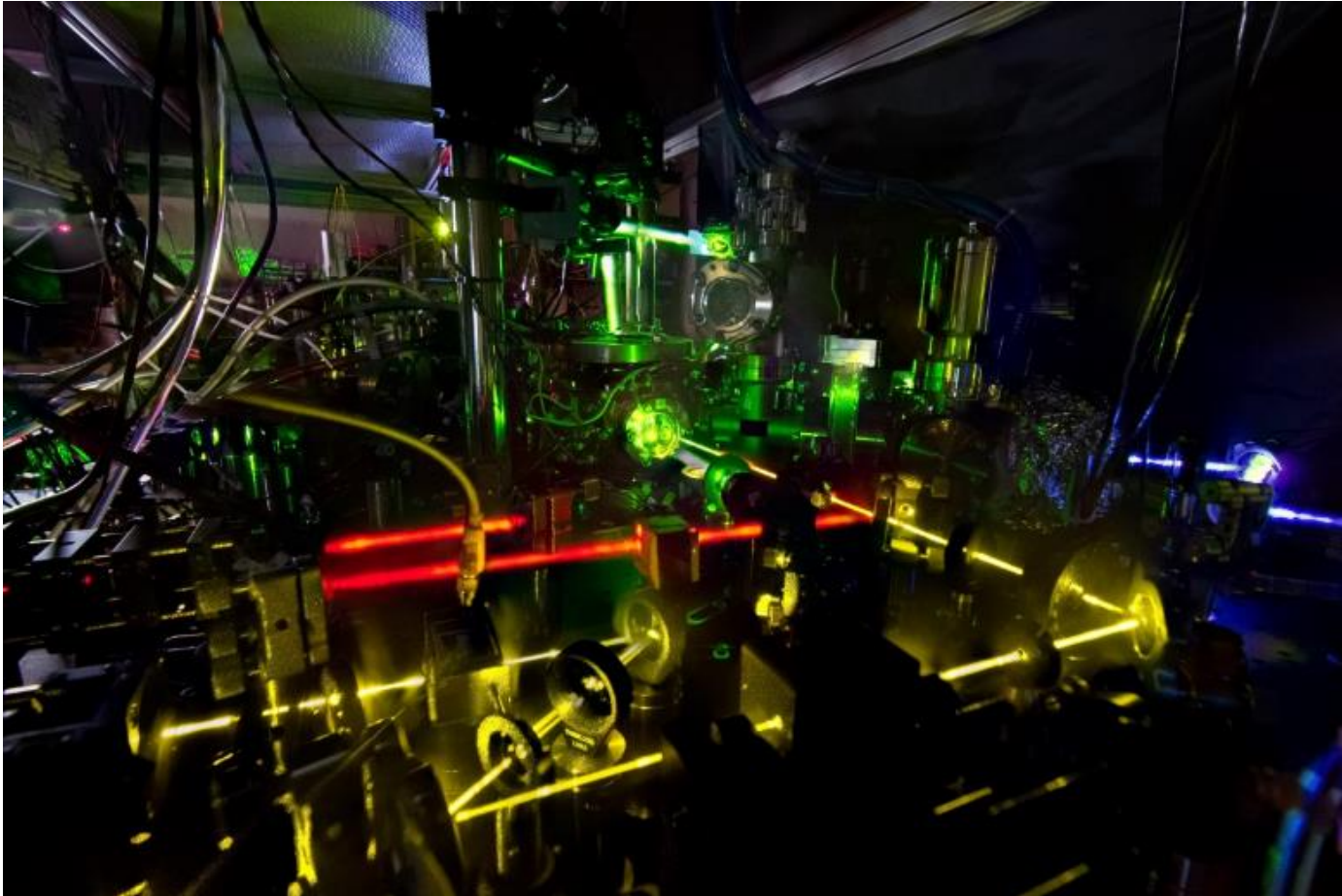
Draft annotated outline issued on August 31, 2020



Workshop on Sept 15-16, 2020



Draft Profile for public comment expected October-November 2020



*Credit: NIST  
Ytterbium lattice clock*

## **Time distribution over optical fiber**

- Fiber installation completed from NIST Gaithersburg to a customer facility in VA
- Achieved uncertainty of 50 ns, smashed the original 1  $\mu$ s performance goal

**Optical Clock Development** – NIST continues development of transportable optical clocks based on ytterbium atoms and is progressing with its new program for an optical clock based on a single strontium ion.

# Trustworthy AI

NIST is developing the vocabulary and measurements needed for technical requirements of trustworthy AI



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Bias in AI: workshop on August 18, 2020



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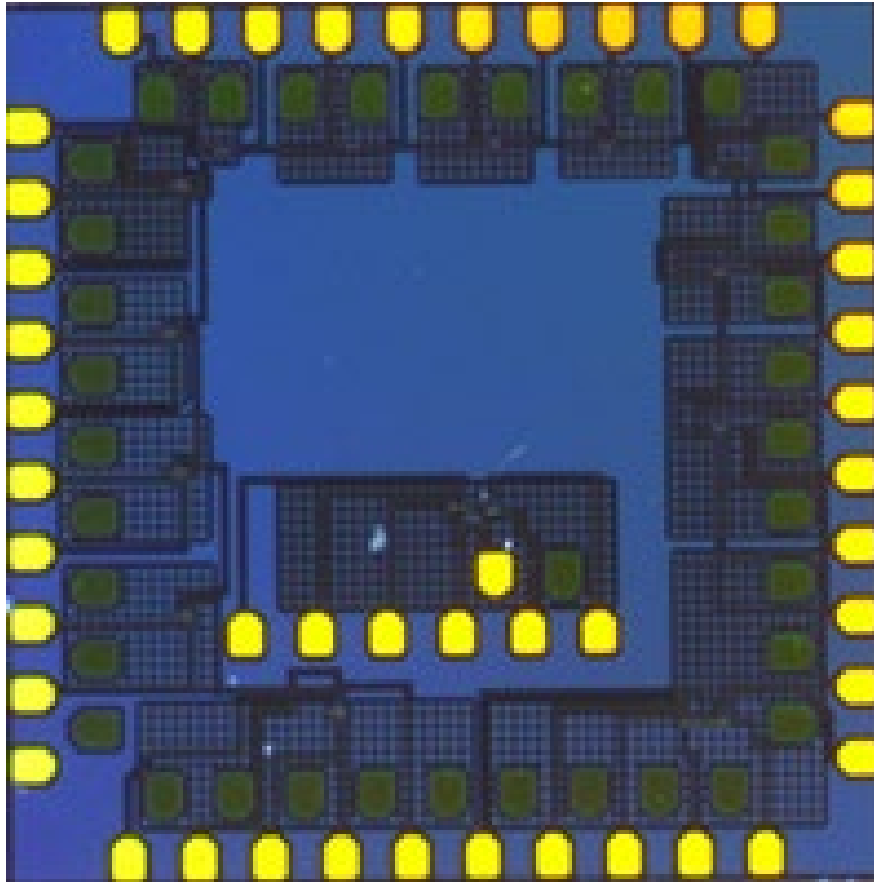
“Four Principles of Explainable AI,” draft posted for public comment August 17-October 15, 2020



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“Secure AI: Terminology and Taxonomy” Final draft expected in Fall 2020

# Novel computational paradigms for AI



A chip where NIST tested the synaptic weighting functions that NIST has been simulating; researchers found agreement between simulations and the tested hardware within the fabrication tolerances.



Establishing metrics and benchmarks for AI hardware



Foundational analysis of the computational capacity of a physical system



Analysis and development of algorithms for spike-based computation

# Use-inspired AI

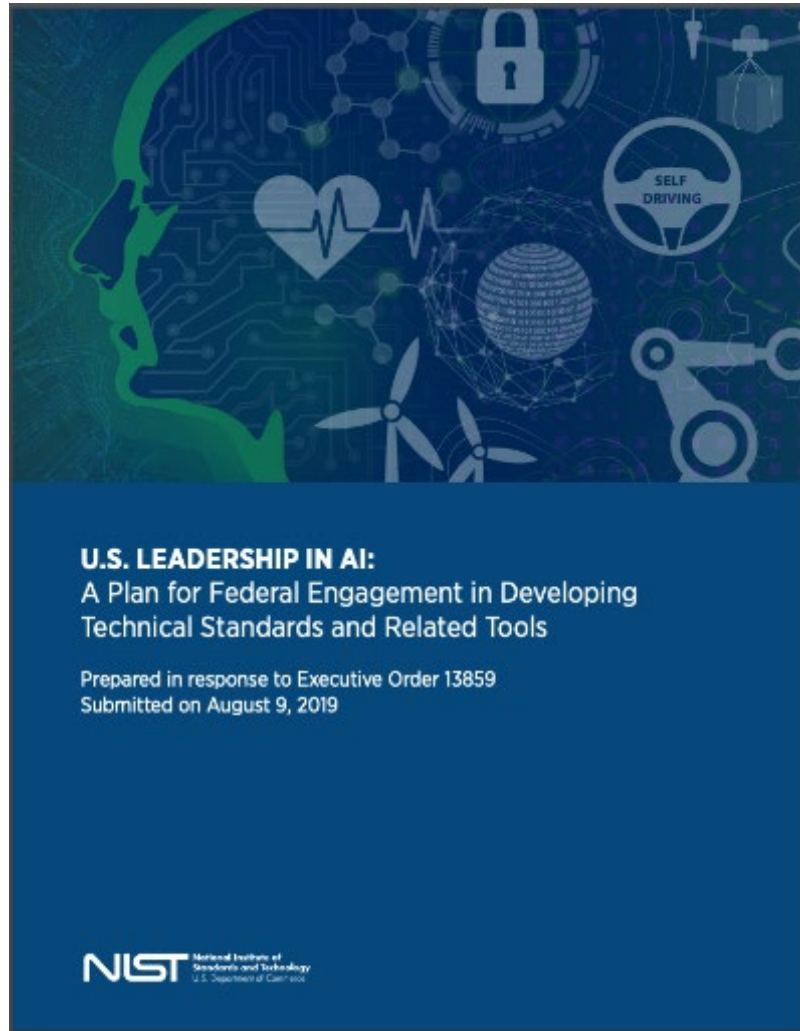
NIST is contributing to the research, standards, and data required to realize the promise of AI as an enabler of American innovation across private and public sectors



Ran an internal funding competition to identify new use-inspired research topics to accelerate the deployment of AI to advance NIST programs



Three projects (MML, PML, and CTL) selected for a total investment of \$3.57 M in FY 2021

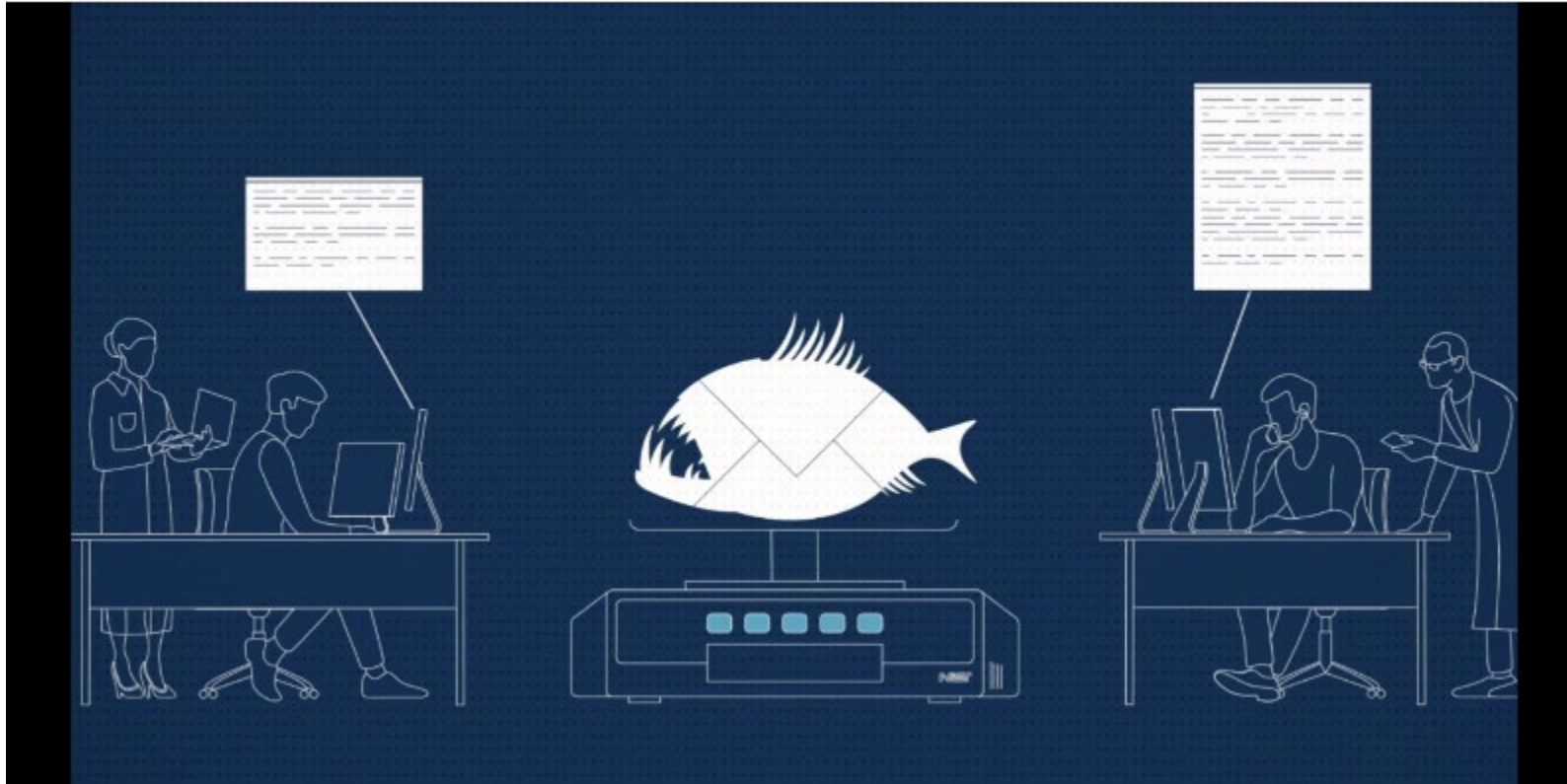


Outreach to connect all federal efforts relating to AI standards development and use, with the goal of the community leveraging and learning from each others' successes



In collaboration with OSTP and the NSTC MLAI Subcommittee NIST will plan and execute an international campaign coordinating efforts in AI standards development

# The Phish Scale



*Credit: NIST*

NIST developed a new method called the Phish Scale that could help organizations better train their employees to avoid a particularly dangerous form of cyberattack known as phishing

# Effect of Masks on Face Recognition Accuracy **NIST**



*Credit: N. Hanacek/NIST*



NISTIR 8311 - Face recognition accuracy with face masks using pre-COVID-19 algorithms



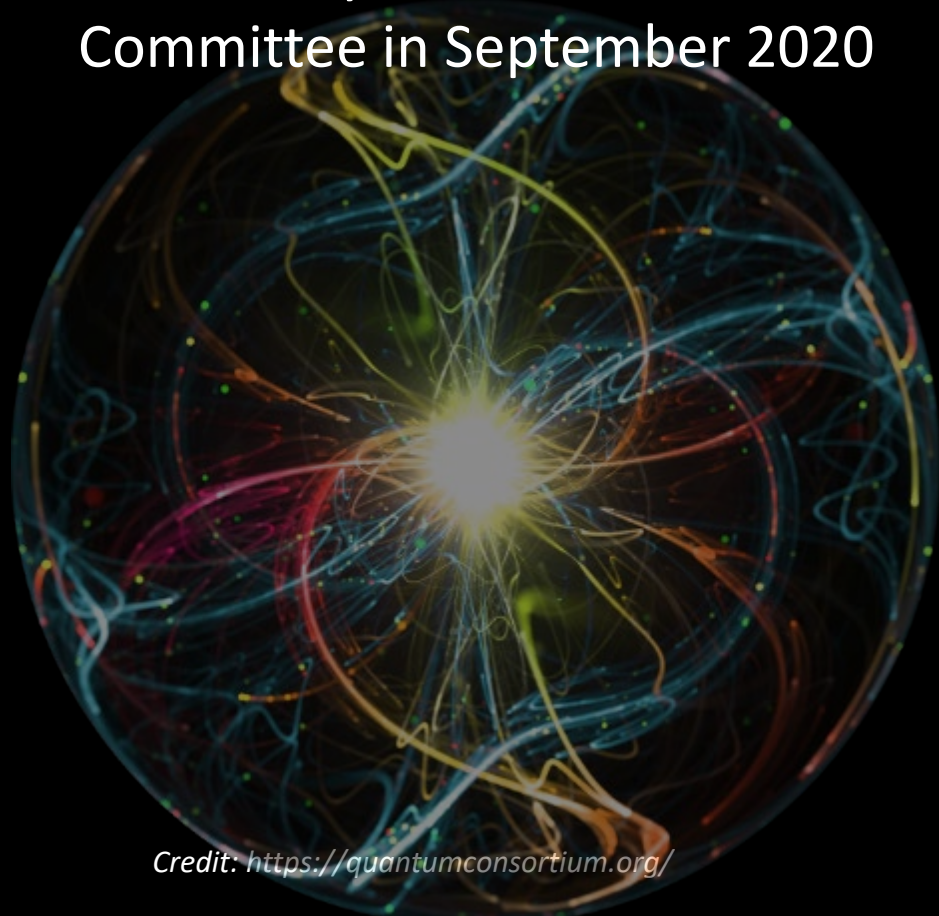
The next report will document accuracy values for more recent algorithms, some developed with capabilities for recognition of masked faces



# Quantum Economic Development Consortium (QED-C)



QED-C formally established its Steering Committee in September 2020



Credit: <https://quantumconsortium.org/>

Goal: lay the groundwork for a new commercial industry based on quantum information science and technologies, as well as the supply chain to support it



Participation agreements signed by Steering Committee and more than 95 other entities, including over 80 companies



Plenary meeting held in September 2020; first R&D project in support of cryogenic technology being rolled out to members



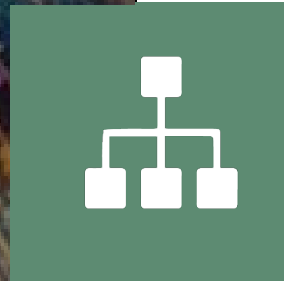
The 180+ *potential members* of the consortium will convert to *members only* in early November

# National Quantum Initiative (NQI): New Activities



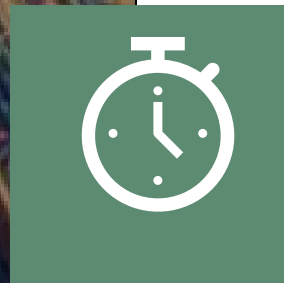
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Initiated first R&D project within the QED-C: began the process of building the supply chain for quantum 2.0 industry



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Initiated a project to demonstrate a potentially compact scalable quantum repeater, one of two roadblocks to quantum networks



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Initiated an effort to demonstrate a compact optical clock that could provide a backup to GPS

**AIP** Review of Scientific Instruments

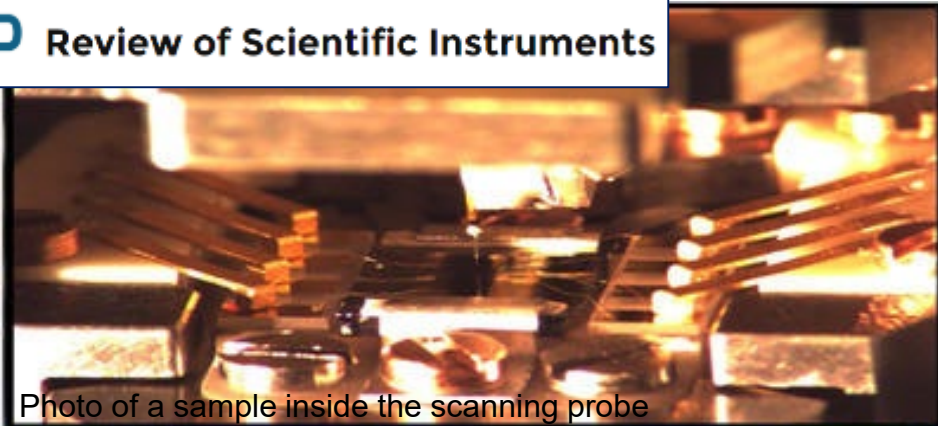
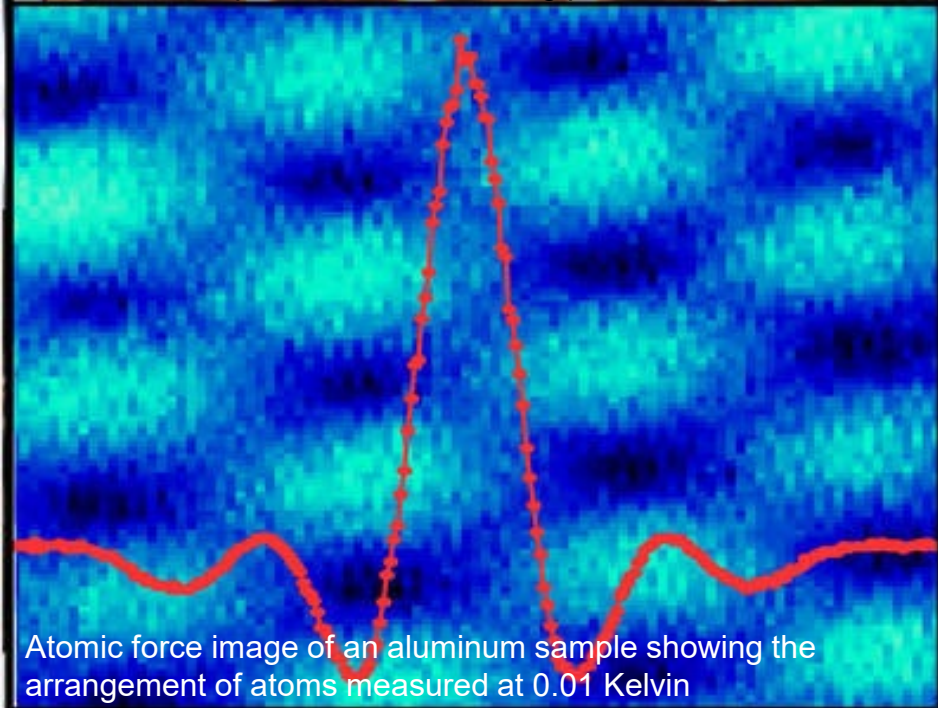


Photo of a sample inside the scanning probe



Atomic force image of an aluminum sample showing the arrangement of atoms measured at 0.01 Kelvin

*Credit: NIST*



New article details ‘Swiss Army Knife’ method/ instrumentation that can precisely make three simultaneous atom-scale measurements to gain new knowledge of special materials



Method connects unusual properties in materials that could be invaluable with their atomic origins & developed new microscope with optimized resolution

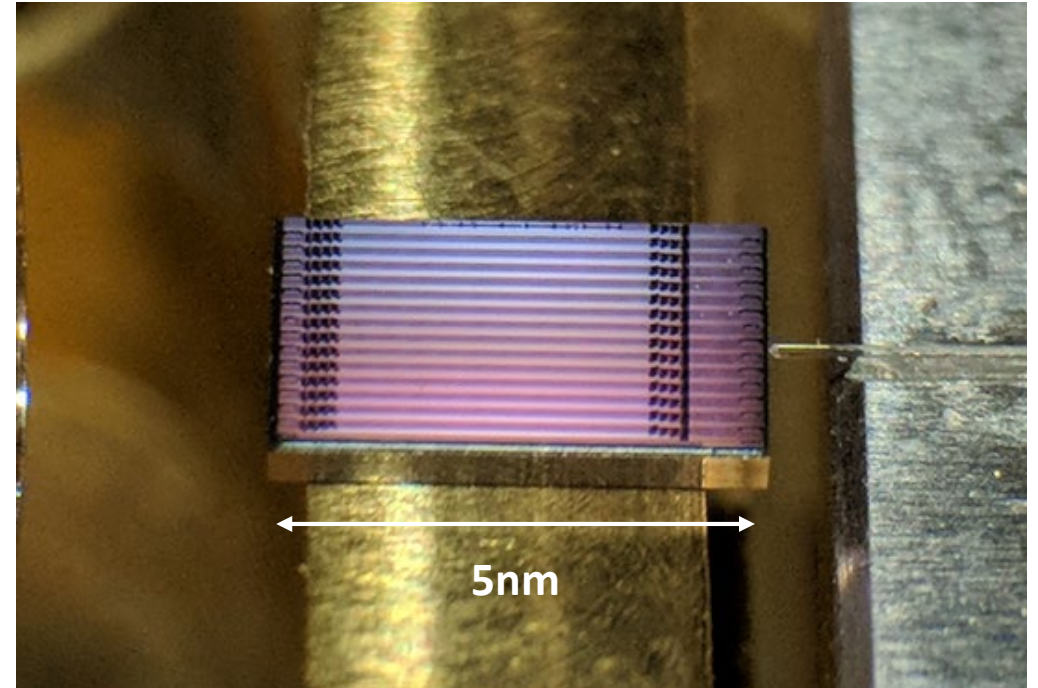


Applicable for development of next generation of quantum computers, communications, and beyond

# NIST-on-a-Chip Update

## Growing Community of Support

- DARPA announced 2 new quantum sensing programs based on NOAC
- NRO invited 4 NOAC proposals for Directors Innovation Initiative
- NOAA, NIST, and DOD working on atmospheric sensing
- Airforce has identified 7 NOAC priorities for outyear investments



NOAC nanophotonic *astrocomb*



## Recent patents

- Rydberg atom mixer and phase determination
- Photonic calorimeter
- Photonic dosimetry

## SAMURAI

Highly accurate 5G measurements in a field scale device



Credit: M. Hammer/NIST

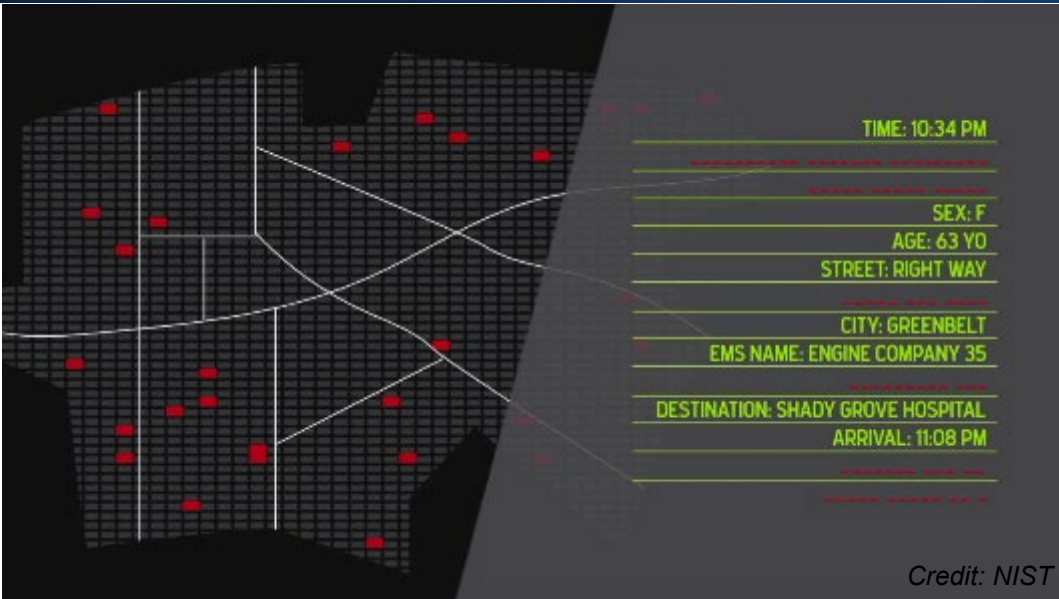
## 5G Frequency Sharing

Developed a formula that allows for efficient frequency sharing



Credit: NIST

# Advanced Communications: Public Safety



Oct 2020: Launched the Differential Privacy Temporal Map Challenge with \$276,000 in prizes for breakthroughs in algorithms for data privacy over three sprints through June 2021



July 2020: Public Safety Annual Stakeholder meeting had more than 1,000 participants and over 100 hours of content

# Community Resilience: Wildfire Studies

## **Chimney Tops 2 Fire** (Tennessee, 2016)

Assessed factors that impact evacuation

## **Camp Fire** (California, 2018)

Released Preliminary Reconnaissance Report

Forthcoming reports on: Fire and Response Data, Fire Timeline

Effort will provide new technical insight to inform best practices for mitigating risks from WUI fires



*Credit : National Park Service*



*Credit : National Park Service*



*Credit : M. Hoehler/NIST*

## ***Interagency Council for Advancing Meteorological Services***



*Credit : Felix Mittermeier from Pixabay*

***Aspirational Goal: “The United States will lead the world in meteorological services via an Earth system approach, providing societal benefits with information spanning local weather to global climate.”***

<https://www.whitehouse.gov/wp-content/uploads/2020/08/Signed-ICAMS-Charter.pdf>



Kicked off by OSTP in August



NIST providing expertise in metrology, cybersecurity, and resilience



NIST is proposed to co-chair Committee on Facilities, Cyber, and Infrastructure



# Manufacturing USA CARES Act Grants Awarded

NIST



9 projects such as rapid testing + domestic PPE production



Expand production using additive and digital manufacturing



Advanced manufacturing skills training



Apply COBOT technology to COVID-19 test processing



Technology roadmap for pandemic response and recovery



The National Institute for Innovation in Manufacturing Biopharmaceuticals

## Tech & Workforce Projects

**\$9.7M**

INVESTMENT IN NEW  
PROJECTS FOR 2019-20

**14**

NEW PROJECTS IN 2019-20



**\$53.6M**

ALL-TIME INVESTMENT  
IN PROJECTS

**58**

PROJECTS LAUNCHED  
SINCE 2017



## Biopharmaceutical manufacturing ecosystem of 155 members

- 65 industry partners
- 62 academic institutions
- 31 non-profits
- 35% increase in membership over prior year



## Technology and Workforce project portfolio of \$53M includes

- 3:1 co-investment of non-federal to NIST funds
- 9 high-impact pandemic response projects sponsored by NIST through CARES Act Funding
- Project Call 4.1 includes funding for global health projects in partnership with Bill & Melinda Gates Foundation

# Manufacturing Extension Partnership



The Go-To Experts for Advancing U.S. Manufacturing



Credit: NIST



Completed award of **\$50M** in emergency funding to support manufacturers in their response to the COVID-19 pandemic



As of September, MEP Centers have:

- Contacted over 71,000 mfrs
- Completed 5,333 projects
- Conducted 3,829 supplier searches
- Initiated 2,858 supplier matches



Assistance has included assessments, webinars, townhalls, virtual trainings, connecting SMMs to local and national resources, return to work plans, supplier capabilities database, re-tooling

Awards to MEP Centers in **all 50 states and Puerto Rico.**

Provides services to manufacturers to help increase production of PPE, to reach new suppliers or markets, and to achieve greater resilience.

# Manufacturing Extension Partnership



## Strategic Competition Program (CAP)

- Key themes of interest:
  - Adv. Manufacturing Technologies Services (AMTS) /Industry 4.0
  - Supply chain
  - Workforce, Business services
- **32** active projects involving over 40 MEP Centers

Purpose: Build network capabilities and solve new or emerging manufacturing problems

## Cybersecurity Guidance

- Special focus on Defense Manufacturers
- **>1,000** defense contractors working with **~30** MEP Centers and **2** NIST labs (EL and ITL).

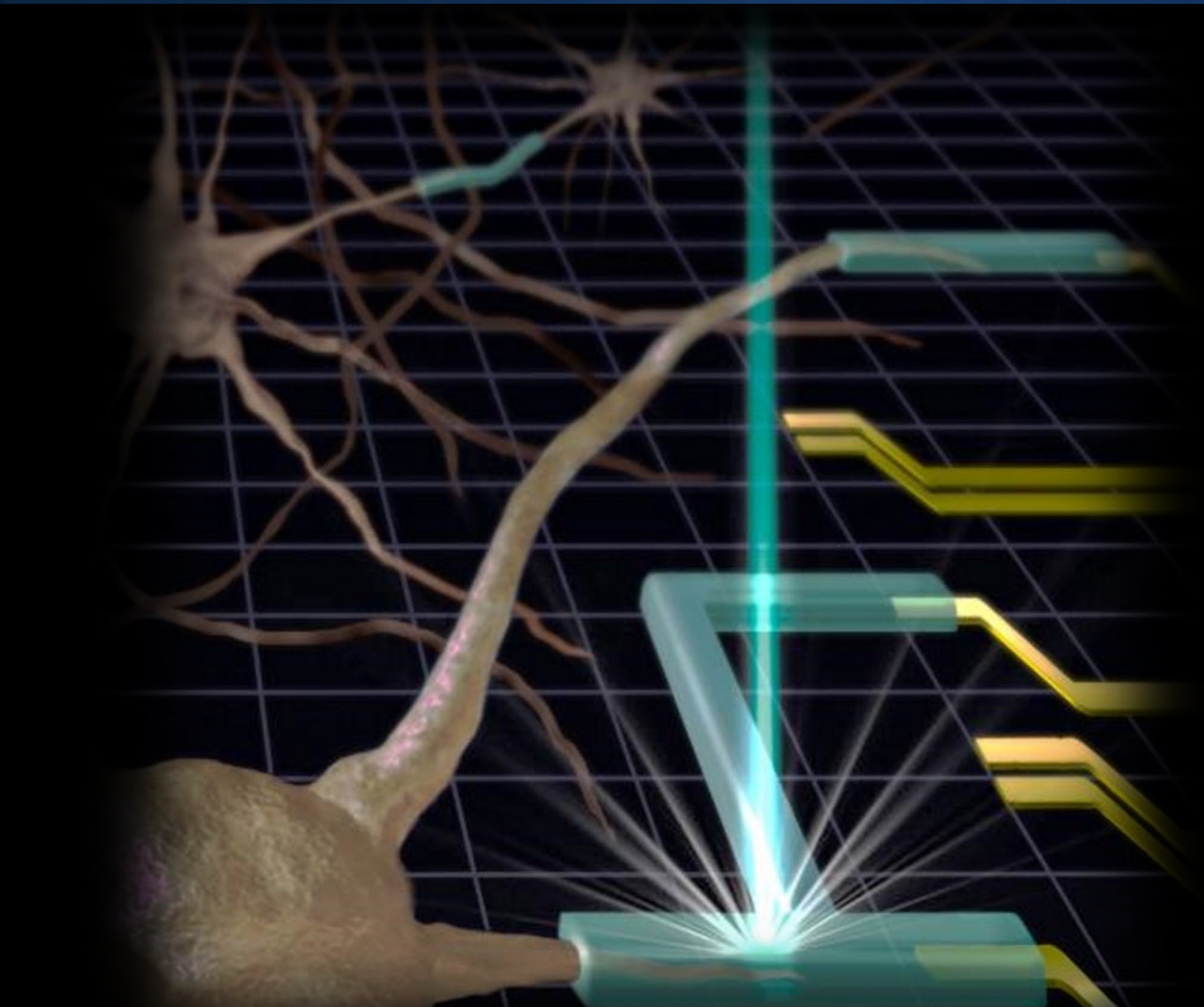
Assisting all 51 MEP Centers

## MEP-Assisted Technology and Technical Resource (MATTR)

- **23** offers of assistance to MEPNN from **5** NIST labs in 2020
- **2** CRADAs between MEP Center clients and NIST Labs

Connecting Center clients with NIST lab expertise and resources

# Manufacturing: 3D Printing of Soft Materials



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Developed new method of 3-D printing gels and other soft materials



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New approach using shorter wavelengths and electrons can produce gels with finer detail

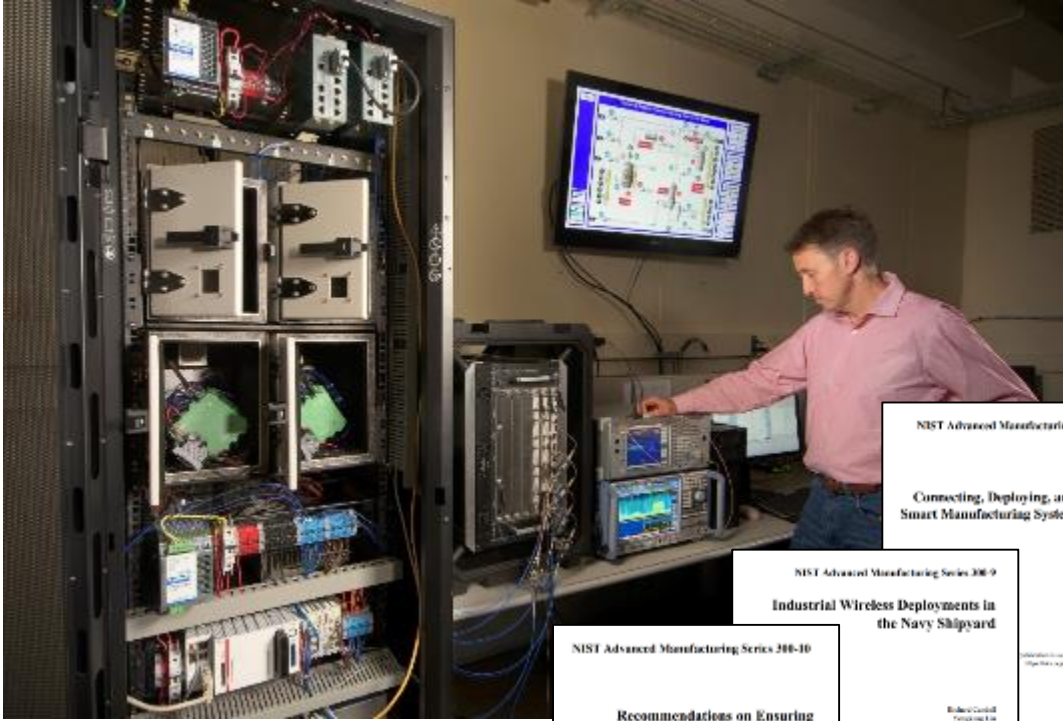


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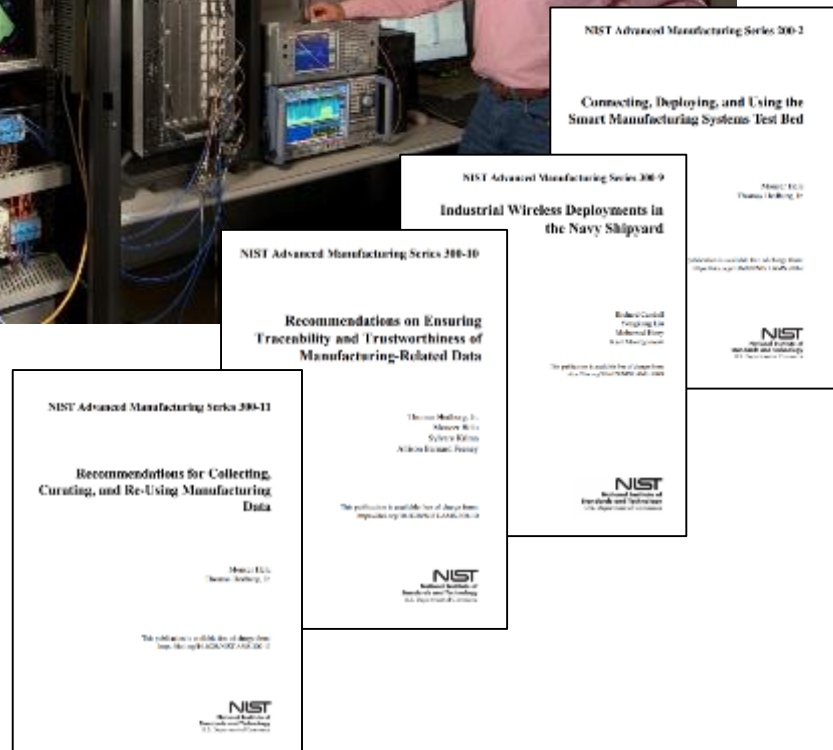
Work could lead to production of tiny medical devices

Illustration of a prospective biocompatible interface shows that hydrogels (green tubing), which can be generated by an electron or X-ray beam 3D printing process, act as artificial synapses or junctions, connecting neurons (brown) to electrodes (yellow). *Credit: A. Strelcov/NIST*

# Smart Manufacturing Guidelines



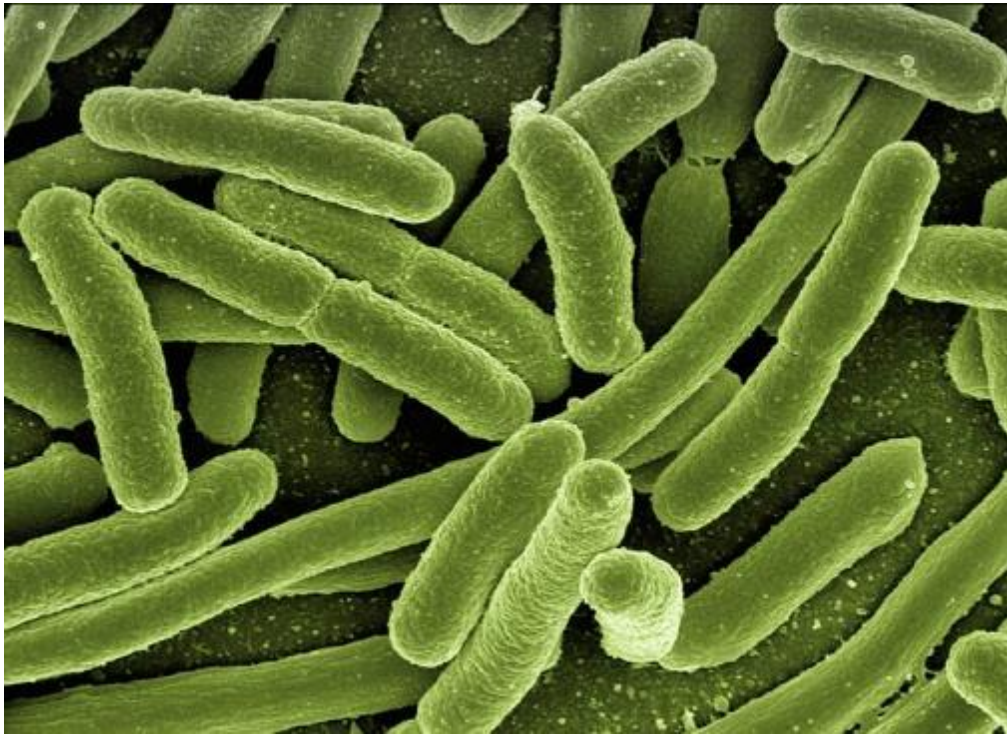
Credit: Earl Zubkoff



Published a series of guidelines on deploying smart manufacturing systems using open, standards-based approaches

- Collecting, Curating, and Re-using manufacturing data
- Traceability and Trustworthiness of Manufacturing Data
- Industrial Wireless Deployments
- Demonstration Cases

# Rapid Microbial Testing Method Consortium



Credit: Pixabay



Launched with virtual workshop Sept 17, 2020, potential members invited to sign Letter of Intent

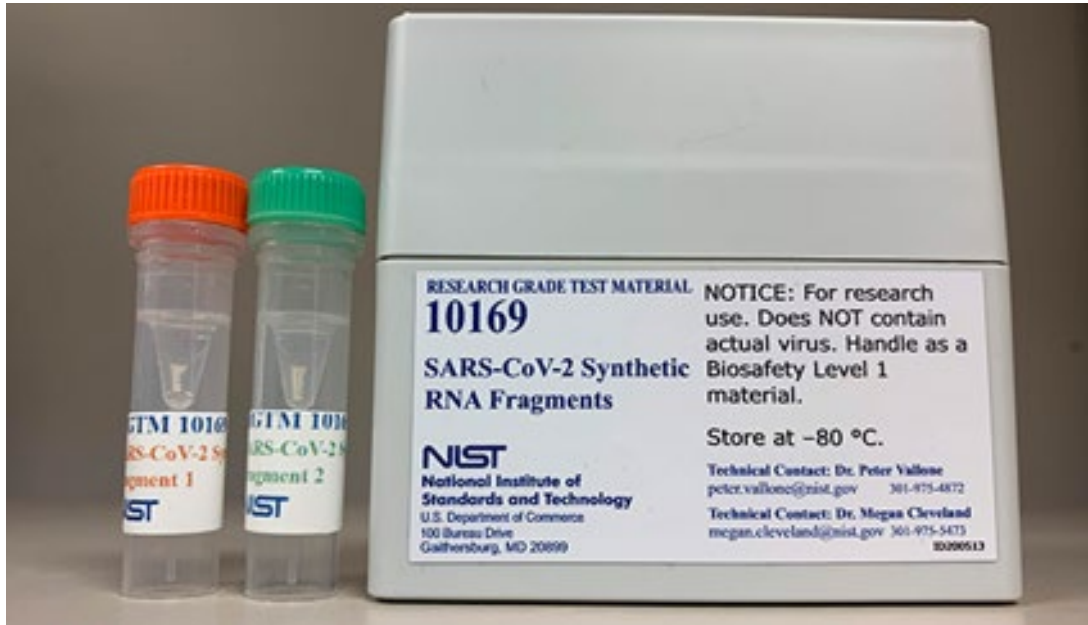


Will address shared needs such as measurements for microbial testing in regenerative medicine products



Will design interlaboratory studies to support best practices and standard methods

# COVID-19 Measurements Update



SARS-CoV-2 Synthetic RNA Fragments  
Reference Grade Test Material



NIST has shipped **over 125** units of RGTM to customers in U.S. and abroad and collecting feedback from users



Initial user input shows material is stable and customer measurements in line with NIST's

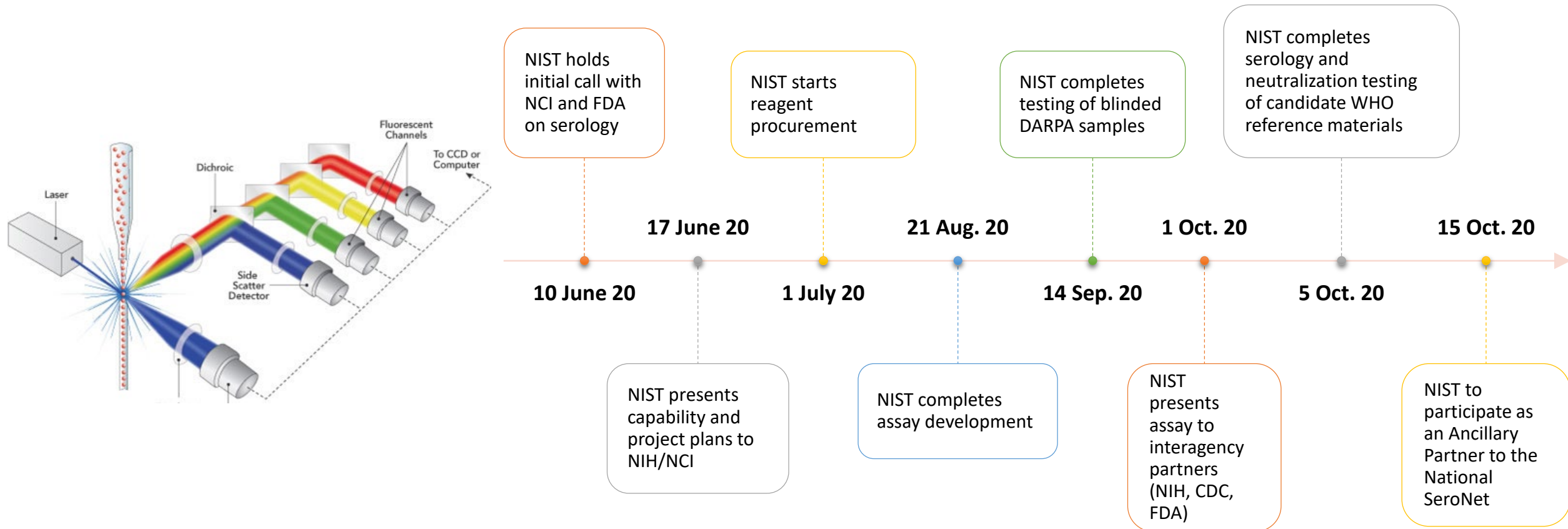


CCQM Working Group on Nucleic Acid Analysis fast-tracked inter-laboratory study for SARS-CoV-2 measurement coordinated by NIST, LGC (UK), NIBSC (UK), and NIM China



# Assays to Support COVID-19 Response: Serology

NIST joining efforts with NIH, CDC, and FDA to study the immune response to COVID-19



# ROI Initiative Progress Year 1.5



April 24, 2020 – one-year anniversary of release of NIST Special Publication 1234



Lab-to-Market NSTC Subcommittee and CAP Goal continue to provide direction on implementation of findings



Nearing milestone completion for initial legislative and regulatory proposals!

## Green Paper Findings Addressed in Proposed Legislation:

Finding 4

Copyright of Government Software

Finding 5

Proprietary Information

Finding 6

Strengthen Technology Transfer at Federal Labs

Finding 7

Presumption of Government Rights to Employee Inventions

Finding 8

Streamlined Partnership Mechanisms

Finding 9

Expanded Partnership Mechanisms

Finding 14

Access to Federal Technologies, Knowledge, and Capabilities

Finding 15

Benchmarking and Metrics

### Current Status:

Finalizing LRM process with OMB.

Delivery to Congressional Committees expected October 2020.

## Green Paper Findings Addressed in Proposed Regulation:

Finding 1

Government Use Rights

Finding 2

March-In Rights

Finding 8

Streamlined Partnership Mechanisms

Finding 13

Federal IP Data and Reporting Systems

Finding 15

Benchmarking and Metrics

### Current Status:

Responses to formal agency comments submitted to Office of Information and Regulatory Affairs

Notice of Proposed Rule Making expected to be published November 2020.

# ROI Progress: Other Areas



NIST scoping MEP/Laboratory tech collaboratives project; L2M inclusive innovation ecosystem prize competition launched in collaboration with SBA



Interagency Edison system rebuild progressing on schedule (expected to launch in FY22); System tours for extramural users planned and user testing will begin shortly



T2 metrics definitions published for Federal Agencies; Model Data Listing for available federal technologies in development; National Academies study on data and digital products winding down (Feb '21 report)

# Recent International Engagements



**NIST is engaging with international metrology partners discussing the impact of the pandemic**

- NIST provide its first online “hands on” lab training to over 30 SIM partners on Radiation thermometry

**The BIRD Board of Governors met on October 13 to discuss the future of the foundation to ensure it continues to be a vibrant mechanism for U.S.-Israel cooperation on innovation.**

**NIST is working with UK Research and Innovation (UKRI) to finalize an MOU focused on Innovation and Commercialization Practices and other areas of mutual interest**

**The US-Australia JCM was held in August**

- NIST’s long history of cooperation with the Australian NMI was highlighted.
- Potential future exchanges and collaborations around QIS and AI were discussed.

# Recent Awards



**Donna Dodson -- Service to America Medal Winner**



**Winnie Wong-Ng – Inducted into LSU Hall of Distinction**



**NIST Team wins Local Emmy for “Rethinking Manufacturing” video**

**NIST scientists and staff continue to be recognized for their outstanding contributions**

**A full celebration of all NIST staff achievements will take place at the 2020 NIST Awards Ceremony**

# DISCUSSION

The background features a complex network of interconnected nodes and lines. The nodes are represented by small circles in various colors, including blue, green, and orange. The lines connecting them are thin and light-colored, creating a web-like structure. The overall aesthetic is modern and technological, with a dark blue gradient background.



# Meeting Agenda

Session I: NIST Update

**Session II: Setting the Stage – The Role of NIST in America’s Evolving Innovation Ecosystem**

Session III: Steps Taken and Future Opportunities

Session IV: Discussion with VCAT