

**VISITING COMMITTEE ON ADVANCED TECHNOLOGY (VCAT)
MINUTES OF THE OCTOBER 23-24, 2017 MEETING
GAITHERSBURG, MD**

ATTENDANCE:

Visiting Committee

Members Attending

Adler, Allen
Brooks, Rodney
Colwell, Rita
Folena-Wasserman, Gail
Garvey, Michael (Mike)
Holt, William (Bill)
Ishak, Waguih
Prafullchandra, Hemma
Sizer, Theodore (Tod)
Vasko, David

Designated Federal Officer

Shaw, Stephanie

NIST Leadership Board

Boehm, Jason
Brockett, Del
Dimeo, Rob
Dowell, Marla
Fangmeyer, Bob
Fasolka, Mike
Harary, Howard
Jenkins, George
Kayser, Rich
Kimball, Kevin
Kushmerick, James
Molnar, Mike
Olthoff, Jim
Porch, Susanne
Rochford, Kent
Romine, Chuck
Royster, Cecilia
Schiller, Susannah
Singerman, Phillip
Thomas, Carroll
Vaughn, Robert (Skip)
Wixon, Henry

NIST Staff

Antonishek, Brian
Barbosa, Nicholas

Barnard-Feeney, Allison
Beall, Kellie
Benkstein, Kurt
Brady, Mary
Brown, Hannah
Cavanagh, Richard
Coraggio, Mary-Deirdre
Dohne, Kirk
Evans, Heather
Feulner, Patricia
Fitzgerald, Ryan
Fowler, James
Garris, Michael
Gayle, Frank
Glenn, Robert
Goldstein, Barbara*
Golmie, Nada
Greene, Gretchen
Greer, Chris
Gundlach, David
Hacker, Christina
Hanisch, Robert
Hanna, Nancy
Hooker, Stephanie
Hughes, Colleen
Ivy, Nahla
Jillavenkatesa, Ajit*
Kaiser, Debbie
Kitching, John*
Liddle, James
Lu, Yan
Makar, Susan
Martinez, Serena
Migler, Kalman
Miner, Laurel
Ouimette, Mylene
Porter, Gail
Pratt, Jon
Pritchett, Jeanita
Przybocki, Mark
Rogers, Kelley
Satterfield, Mary
Schlatter, Katie*
Schlenoff, Craig
Schufreider, Jim
Schuur, Stacy

Scott, John
Seiler, David
Silcox, Barbara
Sokol, Annie
Spitalniak, Vicky
Spurrier, Mark
St. Pierre, Jim
Staymates, Jessica
Stolorow, Mark
Stoughton, Jason
Strouse, Gregory
Strychalski, Elizabeth
Tarlov, Mike
Teske, Michael
Thorne, Roger
Trost, Amy
Tryka, Kimberly
Vanek, Anita
Warren, Jim
Wavering, Al
Williams, Carl
Wilkinson, Richard
Wollman, David
Zangmeister, Rebecca

Others

Copan, Walter
Milliken, Lindsey - Lewis-
Burke Associates LLC

*Participated Remotely

Monday, October 23, 2017

Call to Order - Dr. Rita Colwell, VCAT Chair

Dr. Colwell called the meeting to order at 9:00 a.m. and reviewed meeting logistics. Dr. Colwell introduced and welcomed Dr. Walter Copan, the confirmed nominee to be Under Secretary of Commerce for Standards and Technology and NIST Director.

Dr. Copan introduced himself and provided an overview of his priorities. His first goal the expansion of the NIST's Cybersecurity Framework across all US industries. Second is advanced manufacturing innovation and quality. Third is using NIST's role in federal technology transfer to enable the highest achievable returns on investment from federally funded research. Fourth, NIST will work seamlessly across its organization and with government and private partners to achieve the highest levels of organizational performance and effectiveness while operating at speeds demanded by the American economy.

SESSION I: NIST UPDATE

NIST Update – Dr. Kent Rochford, Acting Under Secretary of Commerce for Standards and Technology and Acting NIST Director

Dr. Rochford provided an update on NIST's safety culture, personnel changes, program highlights, and a discussion of budget and alignment. Beginning with safety, Dr. Rochford showed that there had been a significant increase in recordable cases in FY17. This is particularly driven by slips, trips, and falls, which can be attributed to inattention.

Dr. Rochford then provided a brief update on personnel changes. These included Dr. Walter Copan, the soon be sworn in the Under Secretary of Commerce for Standards and Technology and NIST Director; Mr. Del Brockett, the Associate Director for Management Resources; and Dr. Marla Dowell, the Director of the Communications Technology Laboratory and the NIST Boulder Laboratory Director. Dr. Rochford then mentioned that Dr. Dave Wineland, whose work in quantum science and quantum computing was awarded the 2012 Nobel Prize in Physics, is retiring from NIST. Dr. Rochford briefed the VCAT about NIST's new employee onboarding program, which was launched this fiscal year.

Dr. Rochford then described recent highlights of NIST's programs. NIST scientists developed a three-dimensional (3D) clock, which leads to better clock stability. Next, Dr. Rochford provided an update about the Head Health challenge. NIST and its partners - GE, Under Armour, and the NFL – announced the winners of the third round of the challenge: Dynamic Research of Torrance, California and 6D Helmets of Brea, California.

Dr. Rochford briefed the VCAT on efforts by NIST's programs in response to the recent hurricanes. The Hollings Manufacturing Extension Partnership (MEP) Program issued specialized, 2-year grants to centers in each state affected by Harvey and Irma. These grants allowed the manufacturers to get back up to speed more quickly. In addition, the NIST Labs deployed preliminary reconnaissance teams to Texas and Florida to document damage from the hurricanes and will use the data to help inform the improvement of building codes.

He then provided updates on NIST's programs supporting two executive orders. First, the MEP program has been supporting progress on EO 13806, the Presidential Executive Order on Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States. Through the network of MEP centers, NIST can lead information gathering from small and medium manufacturers to support the interagency task force developed by that EO. Second, NIST is continuing to make progress against its

responsibilities for EO 13800 on Strengthening the Cybersecurity of Federal Networks and Critical Infrastructure. To improve the cybersecurity of federal networks, NIST issued draft guidance on federal use of the Cybersecurity Framework, as well as draft updates to two NIST special publications. NIST has developed a draft report to provide input to help the nation understand the need for cybersecurity workforce and education. Finally, working with others, NIST issued a discussion draft to look at security needs in the Internet of Things (IoT) and botnets.

Dr. Rochford then described NIST's coordinated efforts across multiple programs in cybersecurity. The Baldrige Performance Excellence Program developed a self-assessment tool based on the Cybersecurity Framework to help organizations better understand effectiveness of their cybersecurity risk management. The MEP program provides tools based on NIST's Cybersecurity Framework to support cybersecurity of small and medium manufacturers. These include guides and workbooks in easy-to-understand layman's language to help improve the security of their systems.

Dr. Rochford provided the Committee with a brief update on the progress of the redefinition of the SI. The CIPM (International Committee on Weights and Measures) agreed to proceed with redefinition, which is a major milestone in the process.

Lastly, Dr. Rochford provided an update on the status of the FY2018 budget. The budget is now in congress, and both the House and Senate have published their separate marks of NIST's appropriations. NIST is currently in a continuing resolution until December 2017.

Discussion:

The group discussed the following topics:

- Communication/promulgation of NIST's significant role in medical devices, standardization, and biosecurity areas.
- Zero tolerance for actions that undermine the culture of inclusiveness and diversity, specifically with regard to sexual harassment.
- The onboarding program and how to attract and keep young scientists.
- Concerns about reallocation of funding from science to construction.

For more information, see Dr. Rochford's [presentation](#).

NIST Americium-241 (Am-241) Safety Incident – Dr. Richard Kayser, NIST Chief Safety Officer

Dr. Kayser briefed the VCAT on a radiation exposure incident involving Am-241. Dr. Kayser began his update by asking Dr. Jim Olthoff, Director of Physical Measurement Laboratory (PML) to describe NIST's role in Radiation Physics program. Dr. Olthoff provided a few highlights of how the program interacts with society to demonstrate the impact to the United States, including traceability for mammograms, radionuclides used for treatment and diagnoses, manufacturing, mangos, and homeland security.

Dr. Kayser next described the scope of NIST's license to work with radioactive material, issued by the Nuclear Regulatory Commission (NRC). The NIST Director is responsible for the safety and regulatory compliance in the Radioactive Material program, supported by NIST's Radiation Safety Officer (RSO). Finally, there is an Ionizing Radiation Safety Committee (IRSC) that reports directly to the NIST Director. This committee oversees

the effectiveness of the implementation of the Radioactive Materials program and approves all proposed uses of radioactive material and all source users.

Next, Dr. Kayser briefed the Committee on the recent unplanned contamination event. On August 16, 2017, elevated levels of radiation were discovered during a semiannual leak test in one of the NIST facilities. Access was restricted to the facility, and particularly the room with elevated levels. An investigation revealed that an ampoule containing high-levels of activity of Am-241 had shattered inside a plastic vial, which was stored in a lead container, which itself was stored in a lead cave.

NIST filed a formal event report to the NRC on August 19, 2017 and followed up with communication to the NRC Region 1, Congress, and the Department of Commerce. The RSO and Acting Director of PML had a meeting with source users after the incident to determine who may have been exposed to radiation. NIST engaged the Department of Energy Radiation Emergency Assistance Center / Training Site (REAC/TS). Several tests were run to assess the dose to individuals with potential exposure.

Contamination was discovered in unrestricted areas, so access was restricted to Building 245 on September 11th, and additional studies were performed. The Department of Energy's Radiological Assistance Program team found no Am-241 outside of the restricted areas. The NRC conducted a special team inspection, which characterized NIST's response effort to this incident as "textbook."

Offices in Building 245 were reopened on September 18th. Before each laboratory space was reopened, sources in the space were identified, evaluated for safety, and NIST assessed whether they were critical to mission delivery. The RSO and line management, including the NIST Director, had to approve opening the building to staff.

Dr. Rob Dimeo, Director of NIST Center for Neutron Research (NCNR), briefed the VCAT on the status of the incident investigation performed by a subcommittee of the IRSC chaired by Dr. Dimeo and including three experts from across NIST. The charge given to the IRSC was to determine the circumstances leading to the breach of the ampoule, contamination of areas with Am-241, and personnel exposure to Am-241.

The subcommittee collected data, including health physics survey records, hand and foot monitor data, written statements, and interviews, among others. The subcommittee will then perform an analysis to identify causal and contributing factors, and will develop recommended corrective actions. The subcommittee's final report to the IRSC will be accompanied by individual reports by external experts Dr. Sean O'Kelly, Idaho National Lab; Dr. Timothy Jorgenson, Georgetown University; and Dr. Dan Strom, retired staff scientist from Pacific Northwest National Laboratory.

Discussion:

The group discussed the following topics:

- Long-term program for those exposed to Am-241.
- Risk versus benefit analysis and costs associated.
- How to possibly strengthen the glass material of the ampoule to prevent shattering
- Corrective actions, procedural changes and lessons learned.

For more information, see Dr. Kayser's [presentation](#).

SESSION II: NIST LABORATORY PROGRAMS STRATEGIC VISION

Strategic Vision Status Update – Dr. Kent Rochford, Acting Under Secretary of Commerce for Standards and Technology and Acting NIST Director

Dr. Rochford provided an update to the VCAT about the progress of NIST's efforts to develop a strategic vision for the Laboratory Programs. A draft of the [strategic vision](#) was provided to the VCAT as read-ahead material. He began by reminding the VCAT that in the reauthorization for NIST, the NIST Director, through the Associate Director for Laboratory Programs, was directed to develop a comprehensive strategic plan for the Laboratory Programs. Dr. Rochford described the process for identifying four high-level priorities to best position NIST in ten years

These four areas were grouped into two themes: provide a foundation of trust in new industries and apply new technologies to revolutionize commerce through quantum measurements. The first theme included two "vertical" programs: enabling the future bio-economy through engineered biological systems and unleashing the economic potential of the IoT. The second theme focused on "horizontal" capabilities, which include AI and Data and Quantum SI.

Dr. Rochford asked the Committee to consider and provide input on the following:

- Are these the right priorities?
- Is NIST approaching each priority the right way?
- What are the important considerations in implementation?
- How to balance with the legacy programs?

For more information, see Dr. Rochford's [presentation](#).

Working Session 1: Bio-economy – Dr. Laurel Miner, Program Analyst, PCO

Dr. Miner provided the VCAT with the NIST Laboratory Program's vision in engineering biology. This vision was developed by a team of scientists and experts from across the NIST laboratories with expertise ranging from biology and biochemistry to physics to modeling. She began by highlighting recent advances in technology including next-generation DNA sequencing, 'omics' technology, and targeted gene-editing tools such as CRISPR/Cas9. NIST should provide the measurement tools and standards to establish predictable system design and confidence in the products of those systems. Doing so will build on NIST's current capabilities in genomic measurement assurance, imaging technologies, sensors and nanoscale devices, and data and AI technology, as well as existing partnerships in industrial biomanufacturing, with academic laboratories, and stakeholder communities across biopharmaceuticals and synthetic biology.

Dr. Miner then outlined the vision and strategies for NIST in the bio-economy. The NIST expert team envisioned a future where biological systems can be intentionally and efficiently engineered to produce robust, safe, and trusted outcomes, enabling a growing bio-economy. To enable this vision, NIST will develop a measurement toolkit to quantitatively define critical attributes and performance metrics for engineered biological systems and associated bio-manufactured products; and support the development of foundational knowledge of enabling engineering principles that harness the controlling forces of biological systems. Dr. Miner

emphasized that these two aspects are fundamentally intertwined. Dr. Miner concluded by stating this is an ambitious vision, and that it will be important that NIST is judicious about particular areas of focus.

Discussion:

The group discussed the following topics:

- Overlap with other government agencies, such as the National Institute of Health.
- Engineering a biological system and how it interacts with other systems and measurements.
- How to optimize the system and make it reproducible and consistent.
- How to find areas of focus, for example road maps from the National Institute for Innovation in Manufacturing Biopharmaceuticals and other partners.
- Ensure NIST is not doing just marginal changes but, best-in-the-world research initiatives.

For more information, see Dr. Miner's [presentation](#).

Working Session 2: AI & Data – Dr. Heather Evans, Senior Program Analyst, PCO

Dr. Evans briefed the Committee on the vision for artificial intelligence (AI) and data science developed by a team of researchers from across the NIST Laboratory Programs. Increased interest in AI is driven by an increase in big data sources, better machine learning algorithms, and the improved capabilities of computers.

AI and data are essential to the future of research and scientific discovery, and will therefore be critical assets to NIST's technical programs. In addition, AI and data promise to support industrial competitiveness, which is central to the NIST mission. Therefore, NIST's roles in AI and data include both an internal role supporting NIST research, and an external role supporting trust in these technologies.

The vision developed by the AI and Data team was that NIST's investigation and deployment of data and AI technologies builds confidence and trust that drives new measurement research outcomes and an expanded commercial marketplace. The strategies that will support this include efforts to build expertise, data and analysis, and infrastructure.

NIST must grow its expertise in data engineering, data science, AI/machine learning methods, and improve its ability to match the appropriate analysis methods to different research domains. This expertise should be built both in-house and through partnering with academic, government, and industry leaders. NIST must also increase cross-collaboration and centralized resources. A culture change within NIST is essential to make data usable across space and time, from acquisition to storage, access, and use of data. Finally, NIST needs a robust infrastructure to support faster data transfer, centralized storage, and shared computational resources for the application of modern tools for data analysis and AI algorithms.

Discussion:

The group discussed the following topics:

- How to access the right talent from the right partners.
- Best practices and culture change from a corporate experience perspective.
- How to integrate advanced data analysis techniques into NIST's programs.
- Develop a measurement of trust model for machine learning.

- Determining trust for a system not familiar with.
- Keeping data sets and metadata in an appropriate standard form.

For more information, see Dr. Evans' [presentation](#).

Working Session 3: Quantum SI – Dr. David Gundlach, Rotating Program Analyst, PCO

Dr. Gundlach summarized for the Committee NIST's vision for the Quantum SI (International System of Units). The vision of the Quantum SI rests on the planned redefinition of the SI, which, when coupled with NIST's leadership in quantum science, will enable NIST to transform how metrology is disseminated. Quantum SI devices provide a true value or no value at all, and have intrinsic traceability. In addition, these quantum measurement technologies will advance other fields of quantum science like computing and communications.

NIST's vision for Quantum is to revolutionize commerce through quantum measurement by leading the transition to the Quantum SI paradigm. This will yield transformational benefits in industrial efficiencies, safety, healthcare, and security. The three strategies that will enable this vision are to realize practical quantum SI devices and enabling technologies; improve foundational quantum science and metrology; and create new pathways for technology transfer and Quantum SI adoption.

To develop practical Quantum SI devices and enabling technologies, NIST will need to invest in building quantum sensors from new materials, as well as expertise in interfacing classical systems with quantum technologies. To ensure further leadership in the foundational quantum science necessary to advance the Quantum SI, NIST must develop understanding and control methodology for harnessing the benefits of quantum many-body and entangled systems. NIST also needs to engage external stakeholders at early stages of R&D to understand what will matter to industry. Finally, to ensure that these Quantum SI technologies are used, NIST needs to develop a spectrum of new dissemination methodologies. This will include new methods and partnerships for technology transfer of Quantum SI devices.

Discussion:

The group discussed the following topics:

- How to isolate any quantum devices from impurities or temperature effect that would disrupt the quantum phase.
- Discovering what is the best measurement that can be done with complete confidence away from NIST.
- What is NIST doing in the area of quantum memory.

For more information, see Dr. Gundlach's [presentation](#).

Working Session 4: IoT – Dr. Ajit Jillavenkatesa, Senior Policy Advisor, PCO

Dr. Jillavenkatesa briefed the committee on the vision for NIST in the Internet of Things (IoT), developed by an interdisciplinary team of experts from across the NIST laboratories. IoT's impact on the economy is growing, in areas ranging from medical devices and supply chains to retail environments to the factory setting. The reasons for the trend are two-fold; a reduction in the cost of getting connected and the global growth of the middle class, which will be a big consumer of IoT technologies.

The vision developed by the expert team is that NIST is recognized for developing measurement solutions, and implementation practices that will expedite large-scale adoption of interoperable and trustworthy IoT solutions, helping realize the full potential of connecting humans, systems, and devices. NIST can reduce the time to market and catalyze more reliable and trusted applications of the IoT.

The three key elements of NIST's approach in IoT are connectivity, interoperability, and trust (security and privacy), which are all underpinned by data for control and analytics. For connectivity, how can NIST help ensure networks have the capacity to connect to the potentially billions of new devices and will the devices work as they are designed to. NIST's interest in interoperability is focused on technical barriers, rather than business-level interoperability. NIST's strategies focus on the measurements and research for development of IoT systems; the tools that can support the deployment and the operation of the IoT systems; and, the strategic collaborations and partnerships to understand stakeholders needs and drive standards development.

Discussion:

The group discussed the following topics:

- Aspects to consider given the exponential differences between industry investments in IoT technologies and applications as well as NIST's current and future investments.
- How to support industry with externalities that are out of NIST's control.
- NIST's role in creating classifications for IoT systems.

For more information, see Dr. Jillavenkatesa's [presentation](#).

Tuesday, October 24, 2017

SESSION III: MANAGEMENT RESOURCES SERVICE DELIVERY

NIST Service Delivery Plan – Mr. Del Brockett, Associate Director for Management Resources

Mr. Brockett briefed the VCAT on his plans to improve the delivery of services provided by the management resources directorate to ensure more efficient and effective delivery of the NIST mission. He began by describing how NIST approaches and structures its services within the Management Resources (MR) directorate. MR, which provides services to both campuses, has about 1,100 staff or contractors and a budget of approximately \$175 million annually. MR includes finance, acquisitions, safety, security, facilities, human resources, and information technology, as well as offices that provide for civil rights and diversity, the NIST library function, and fabrication.

The agility and flexibility demanded by NIST's mission are not being met by the performance of the MR services. NIST will invest in a service management framework to become a transparent data-driven organization, which will enable MR to not only align to the NIST mission, but to also benchmark with industry leaders. This improvement will require more data about the current performance of those services. MR's strategic approach will also include efforts to strengthen partnership and governance models between programmatic and service organizations, as well as better risk appetite alignment with the NIST mission.

Ideally, service management involves engineered processes, which requires understanding what those processes are, and ensuring that they are optimized and standardized. That process engineering must be focused on the customer need.

Mr. Brockett next described the three current capabilities that MR has in place to improve service management: service teams that engineer and deploy internal services, an online service portal, and a walk-in service desk. Next, Mr. Brockett shared a examples of where service management have decreased process time, costs, and downtime across IT, reimbursable agreements, and hiring.

Mr. Brockett next summarized the next steps for implementing service management at NIST. MR must still demonstrate that service management can transform customers' experiences; make it easier for external customers to interact and collaborate with NIST; and create a sustainable model that can react to organizational changes and create competitive advantages.

To improve the customer experience, MR plans to align processes to match customer needs. Mr. Brockett would like to develop process packages that automatically and transparently guide customers through common actions. NIST's external customers will experience the same benefits of improved processes as internal customers. In addition, there are plans for new e-commerce storefronts for NIST's measurement services and improved processes that include external parties.

Last, Mr. Brocket outlined the components of his plans to create a sustainable model. Since a critical component is improving understanding of customer needs, MR service organizations are creating a set of advisory boards as a pilot effort. The advisory boards will be composed of internal stakeholders and are asked to identify priorities in service areas. The data obtained would be rolled into an annual process, with the goal of improving the understanding of customer needs, evaluating performance objectively, improving the understanding of services, and then focus on making additional improvements.

Discussion:

The group discussed the following topics:

- How the VCAT pursues alignment between mission and support organizations.
- How the VCAT approaches service delivery strategically within their organizations.
- Importance of embedding service providers within programs.
- What if any are shared challenges and opportunities.
- Group staff meetings verses a pilot of advisory boards

For more information, see Mr. Brockett's [presentation](#).

SESSION IV: NEXT STEPS AND ADJOURN

Administrative Business

Dr. Colwell mentioned the elections or the VCAT Chair and Vice Chair will take place as part of the February 2018 meeting. Both positions will be elected for a two-year term beginning April 1, 2018, and ending March 31, 2020. As a reminder, members cannot serve on the Committee for more than two consecutive terms. If the elected Chair or Vice Chair is a member whose second term on the VCAT ends before the end of the term of the Chair or Vice Chair, the VCAT will hold interim elections to select a member to complete the remainder of the term. Candidates must be willing to serve and be familiar with NIST and VCAT operations.

Lastly, Dr. Copan officially took the reins as the Under Secretary of Commerce for Standards and Technology and NIST Director.

There were no public comments offered.

In closing, the VCAT members thanked Dr. Rochford for his leadership of VCAT and as the Acting NIST Director.

Adjournment

The meeting was adjourned at 11:00 AM.

I hereby certify that to the best of my knowledge; the forgoing minutes are accurate and complete.

Stephanie Shaw, Designated Federal Officer, NIST Visiting Committee on Advanced Technology

Dr. Rita Colwell, Chair, NIST Visiting Committee on Advanced Technology