

**VISITING COMMITTEE ON ADVANCED TECHNOLOGY (VCAT)
MINUTES OF THE JUNE 9-10, 2015 MEETING
GAITHERSBURG, MD**

ATTENDANCE:

**Visiting Committee
Members Attending**

Brooks, Rodney
Chand, Sujeet
Colwell, Rita
Garvey, Michael
Haymet, Tony
Holt, William*
Kerr, Karen
Padovani, Roberto
Prafullchandra, Hemma
Solomon, Darlene
Tracy, John
Wilson, David

VCAT Exec. Dir.

Lellock, Karen

NIST Leadership Board

Boehm, Jason
Brockett, Del
Cavanagh, Rich
Celotta, Bob
Dimeo, Rob
Dohne, Kirk
Jenkins, George
Kayser, Rich
Kimball, Kevin
Locascio, Laurie
May, Willie
Olthoff, Jim
Porch, Susanne
Rochford, Kent
Romine, Chuck
Salber, Stephen
Saunders, Mary
Singerman, Phillip
Thomas, Carroll
Wixon, Henry

NIST Staff

Acierto, Linda
Allocca, Clare
Banovic, Steve

Baum, Michael
Black, Paul
Daniels, Yasmine
DeLongchamp, Dean
Dienstfrey, Andrew
Evans, Heather
Fasolka, Mike
Gaitan, Michael
Gayle, Frank
Gillerman, Gordon
Goldstein, Barbara
Green, Ashley
Holbrook, Dave
Hughes, Colleen
Jillavenkatesa, Ajit
Kaiser, Debbie
Kemper, Yvonne
Liddle, James Alexander
Lin-Gibson, Sheng
Miner, Laurel
Newman, Michael
Ortiz-Montalvo, Diana
Plant, Anne
Pritchett, Jeanita
Przybocki, Mark
Roberts, Kamie
Robinson, Crissy
Salit, Marc
Scanlan, Leona
Schufreider, Jim
Semerjian, Hratch
Shaw, Stephanie
Small, John
Sokol, Annie
St. Pierre, James
Strouse, Greg
Stuhl, Benjamin
Szalai, Veronika
Tarlov, Michael
Thorne, Roger
Yashar, David
Yoon, Howard
Zangmeister, Rebecca

Others

Ammann, Paul – George
Mason University
Colvis, Christine – NIH
Deans, Robert – Athersys
Koenig, Scott - MacroGenics
Lopez- Perez, Daneli -
FDA
Reed, Daniel – Univ. of Iowa

*Participated Remotely

Tuesday, June 9, 2015

Call to Order – Dr. Tony Haymet, VCAT Chair

Dr. Haymet called the meeting to order at 8:30 a.m. and pointed out the emergency exits. Dr. Haymet offered official congratulations to Dr. May on his confirmation as the second Under Secretary of Commerce for Standards and Technology, and the 15th director of NIST. Dr. Haymet mentioned this will be his last official meeting as his term on the VCAT expires in August. He provided logistical information about the meeting and outlined the overall schedule.

OVERVIEW AND SAFETY

NIST Update and Agenda Review – Dr. Willie E. May, Under Secretary of Commerce for Standards and Technology and NIST Director

Presentation Summary: Dr. May presented Dr. Haymet with a certificate recognizing him for his leadership on the VCAT and thanking him for his time serving as Chair of the Committee.

Dr. May updated the Committee on a safety incident involving vials of uranium material that date back many years. NIST contacted the Nuclear Regulatory Commission (NRC) and an investigation was conducted. NIST received one cited violation for not having this substance in the inventory system. NRC also provided additional comments and feedback complementing NIST on the way the situation was handled and NIST's plans to ensure this does not occur again.

Dr. May reminded the VCAT of his primary goals to ensure NIST has a strong leadership team, to continue to strengthen the safety culture, to continue to implement the new programs started over the last five to six years, to review the long-term stability and sustainability of the Baldrige Program, and to strengthen the MEP program. Dr. May also added that he is focusing on improving the efficiency and effectiveness of NIST's internal operations while increasing staff engagement in the direction and the implementation of NIST programs.

In the area of senior leadership, only the Associate Director for Laboratory Programs remains vacant. This position was posted near the end of April and closes June 26th. Since the last meeting, Carroll Thomas has been officially appointed as the Director of the Manufacturing Extension Partnership (MEP) program. Gordon Gillerman has been selected as the Director of the Standards Coordination Office (SCO), and Mike Molnar has been selected as the Director of Advanced Manufacturing National Program Office (AMNPO) pending final approvals.

Dr. May updated the VCAT on the progress of the operational improvement teams focused on acquisitions, agreements, human resources, and legal services. The top four recommendations from each task group have been identified and NIST is outlining implementation strategies. Updates to staff on the progress and next steps with the recommendations are being communicated.

Dr. May outlined the new Colleague's Choice in Innovations in Measurement Science Program that provides an open competition to encourage and reward staff creativity by putting them in charge of identifying, selecting, and solving significant challenges in measurement science and is part of a more general effort to broaden staff engagement. In the first stage, NIST staff propose new measurement, standards and technology challenges that NIST should undertake, discuss and rate the challenges. Stage

two allows for NIST staff to propose solutions to the challenges identified in the first stage. The winners selected will receive funding up to \$1M per year for 3 years.

Dr. May provided an update on the NIST budget highlighting that the Institute has been fortunate to have received sustained budget growth over the past 10 years. The FY16 budget request again includes increases for both the NIST Laboratories and the extramural programs along with a modest increase for construction programs. The House mark for NIST is \$80 million below the President's request for the labs, no increases for our extramural programs, and also no increase for NIST construction.

A number of recent staff awards and recognitions were shared that highlight accomplishments from across the NIST organization. Dr. May also highlighted several research accomplishments, including the F2 cesium fountain clock that has a tick rate accuracy of 1 second in 300 million years. Essentially this clock is so sensitive that it can measure the difference in gravitation by moving it just two centimeters. If it moves vertically two centimeters there is a difference in the tick rate that makes it an extraordinary measurement tool as well.

Recent programmatic efforts were highlighted including, the completion of two rounds of the MEP state competitions focused on optimizing the federal investment in the MEP program to better serve U.S. manufacturers. Plans for the other two competition rounds were also shared. Dr. May also discussed the recently released R&D roadmap for Public Safety Communications that addresses trends, drivers, and software applications.

Dr. May concluded his presentation with an update on several new and expanded programmatic partnerships. The first was a recently signed Memorandum of Understanding with MedImmune, where the company is funding seven postdocs to work at NIST. This is a new model for NIST and may be one NIST decides to expand with other organizations. NIST's Centers of Excellence program has recently expanded with the announcement of the new center focused on forensic science. Iowa State University, Carnegie Mellon University, the University of Virginia and the University of California, Irvine will be coming together to focus on improving the statistical foundation for fingerprint, firearm, toolmark, dental and other pattern evidence analyses, and for computer, video, audio and other digital evidence analyses.

Discussion: The group discussed the following topics:

- NIST's technology transfer activities and mechanisms.
- NIST's efforts to support employee engagement based on responses to the Federal Viewpoint survey.
- The status and future funding for the Manufacturing Institutes.

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

Safety Update – Richard Kayser, Chief Safety Officer

Presentation Summary: Dr. Kayser discussed one of the planned actions stemming from the 2014 Safety Climate survey focused on employee rights and responsibilities. Every employee and associate has certain rights and should feel free to exercise those rights without fear of reprisal of any kind. NIST wants everyone involved in safety, committed to identifying unsafe conditions and practices and to speak up to take action to make sure issues get addressed. Safety rights and responsibilities are in several aspects of NIST's safety leadership training. Dr. May reached out to NIST supervisors and Safety

coordinators sharing the employee's safety rights information before disseminating to all staff. He took the opportunity to remind them of the critical role that they play in creating a safety conscious work environment. When the responsibilities were sent to all staff, Dr. May emphasized the importance of speaking up and calling attention to unsafe work environments.

Discussion: The group discussed the following topics:

- Safety standards included in manager's and employee's performance plans.
- Safety Ombudsman position at NIST.
- Reward or recognition system to encourage public safety reporting.

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

NIST Wide Planning Activities and Workforce Study Needs and Trends – Jason Boehm, Program Coordination Office

Presentation Summary: Dr. Boehm outlined plans for a workforce study focused on assessing future workforce needs, external workforce factors, trends and education, and new demands of the millennial population. NIST will begin with a pilot study focused on the first part, assessing NIST's future workforce needs. Dr. Boehm then introduced a panel of NIST Post-doc employees who participated in a session to learn about why they came to NIST, the opportunities and challenges of working at NIST and if they would consider as a career choice for the future.

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

BIOSCIENCE REVIEW

Review of NIST Bioscience Research Programs and Activities - Laurie Locascio, Director, Material Measurement Laboratory (MML)

Presentation Summary:

Dr. Locascio provided background on the history and evolution of the bioscience program at NIST. In support of the biosciences NIST performs cutting-edge measurement science research across 5 laboratories to develop high-quality measurement standards to support confidence in biological data. She outlined NIST's current portfolio of activities and research in the bioscience area. Specifically, in the areas of biomanufacturing, bioimaging, and protein sequencing. Dr. Locascio highlighted a number of partnerships that have evolved over the years to support NIST's bioscience research, including federal partners like National Institutes of Health and Food and Drug Administration. Several partnerships with academia have led to joint initiatives including the Institute for Bioscience and Biotechnology (IBBR) with the University of Maryland focused on biomanufacturing and more recently the Joint Initiative in Measuring Biology with Stanford focusing on measurement, standards and informatics for genetics and the emerging synthetic biology area.

In 10 years NIST has developed strong core capabilities in target areas of molecular and cellular analysis. Going forward, NIST has identified the following areas of strategic importance (2015-2020).

- **Quantitative Tools for Characterization of Complex Biologics**
Define complex biomolecules/biologics through quantitative measurements to enable prediction of biological function in healthcare applications

- **Microbial Measurements**
Develop measurement infrastructure for microbial measurements
- **Engineering biology**
Develop the measurements and models for engineering biology to map out the fundamental principles that drive development of next generation bio-based products
- **Precision Medicine**
Develop measurement science and standards to ensure confidence in clinical decision-making, and ultimately enable adoption of precision medicine
- **Data and Informatics**
Provide validated data and informatics tools to support confident decision-making

Discussion:

- Coordination and collaboration activities across NIST to support the bioscience work.
- Collaborations outside of North America.
- NIST's role in instrumentation sequencing.

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

Panel of Internal NIST speakers - Protein Therapies – Mike Tarlov, Chief Biomolecular Measurement Division, MML, Cell measurements – Anne Plant, Program Director, Biosciences, MML, Synthetic biology – Marc Salit, Leader, Genome-Scale Measurements Group, MML

Each presenter provided an overview of the research and activities in their area.

Dr. Tarlov discussed the work NIST is doing to support biomanufacturing, the part of the biotechnology industry that discovers, develops and manufactures protein drugs. Essentially, this involves identifying a protein as a candidate drug, identifying the gene responsible for expressing that protein, inserting this into cells which are cultured, expanded and put into large scale bioreactors where many copies of the protein will be manufactured. The work NIST is doing is focused on addressing measurements, standards and data needed to support the development and manufacturing of protein therapeutics. Through this program, NIST works closely with stakeholders in industry and other federal agencies to identify the key biopharmaceutical measurement challenges that need to be addressed.

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

Dr. Plant outlined NIST's work in the area of cell biology. Applications of cells include production of commodity chemicals (synthetic biology), production of therapeutic proteins, screening potential pharmaceuticals, regenerative medicine, and personalized diagnostics and treatment. The ability to engineer cells for a particular purpose or function is a complex biological response. Part of NIST's research involves taking the complex function and determining how to quantify it so there is confidence in the measurements and reproducibility in testing methods.

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

Dr. Salit highlighted the work NIST is doing with synthetic biology. This research area is focused on engineering living matter to make biosensors and materials. In this space people are developing their own technologies and there is not yet a common language to support this area. NIST is working to

provide the standards needed. NIST participates in a number of working groups to provide recognized standards, reference materials, data, documentary standards, protocols, and industrial road maps to this growing technology area.

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

Discussion:

- Partnerships, engagements and collaborations supporting each of the research areas.
- Ethical considerations for the research conducted in this area.
- Global considerations in the bioscience field.

Bioscience Industry: Future Direction & Trends in Therapeutics - *Christine Colvis, Director for Drug Development Partnership Programs, National Center for Advancing Translational Sciences, NIH, Robert Deans, Executive Vice President for Regenerative Medicine, Athersys, Scott Koenig, President & CEO, MacroGenics*

The VCAT heard from a panel of external speakers working in the bioscience field.

Dr. Colvis discussed her work at NIH focusing on repurposing investigational drugs that pharmaceutical companies decided to discontinue. She highlighted one of the challenges facing the industry right now - the ability to reproduce published research findings. This is due to a variety of factors from the publishing culture to restricting article length to policies restricting the publication of negative results. Dr. Colvis described some the methods NIH is using to mitigate these issues and work with stakeholders to improve the quality of the published materials to support the broader technical community.

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

Dr. Deans talked about the work of his company with adherent adult stem cells isolated from bone marrow to support immunological, neurological, and cardiovascular issues. He outlined the production process and the research needs and current challenges to increasing capacity and scaling up manufacturing. He suggested areas where NIST, working with industry, can help drive consensus to anticipate gaps and measurement needs and to promote international cooperation.

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

Dr. Koenig outlined the 5 major pillars of biological therapeutics – vaccines, replacement therapy, antibodies, gene therapy, and cell therapy. He shared his views on the biopharmaceutical industry and protein therapeutics research over the next the next 5-10 years with a focus on antibody research. According to Dr. Koenig, future trends and directions in this area should include increased effort to more specifically target tumors, increased focus on combination therapy (antibody-antibody combinations), and technological breakthroughs generated by cancer-focused research that should start to filter through to other disease areas.

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

Discussion:

- Technology transfer opportunities to support the bio industry.
- Collaborations across the industry.

Institute for Bioscience and Biotechnology Research (IBBR) & National Cybersecurity Center of Excellence (NCCoE)

Dr. May provided background on NIST's partnerships with the IBBR and the NCCOE. The VCAT departed NIST for a tour of the two facilities.

Wednesday, June 10, 2015

INFORMATION TECHNOLOGY/CYBERSECURITY REVIEW

Review of NIST Research Programs and Activities – Chuck Romine, Director, Information Technology Laboratory

Presentation Summary: Dr. Romine outlined the three strategic drivers unpinning the research and standards work in this technology space. They include: fundamental research in mathematics, statistics and IT; applied IT research and development; and, standards development and technology transfer. Dr. Romine provided examples of the cross-institute research projects supporting each of these areas. He also outlined the priority growth areas that will cut across all strategic drivers to support industry needs in software defined networks, cryptography, big data, privacy, software assurance, and metrology for scientific computing.

Discussion:

- NIST's ability to attract people with the talent and skills to address these technology areas.
- Ability to connect with small to mid-size enterprises.
- Discussion of documentary standards versus measurement standards.
- Importance of cross-institute collaborations and engagements.

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

Panel of Internal NIST speakers - Metrology for Scientific Computing- Andrew Dienstfrey, Manager, Virtual Measurement Systems Program, ITL, Big Data – Mark Przybocki, Leader, Multimodal Information Group, ITL, Software Quality- Paul Black, Acting Leader, Software Quality Group, ITL

Each presenter provided an overview of the research and activities in their specific area.

Mr. Dienstfrey discussed metrology for scientific computing. Measurement science for IT is about uncertainty analysis using computations for predictive capability. He provided examples involving industrial stakeholders, other federal agencies, and even some public policy decisions. For example, one project with Boeing involves using molecular dynamic simulations to characterize advanced polymers with the goal of using computational analysis to do rapid screening for new materials.

Mr. Przybocki discussed the work NIST is doing in the area of Big Data. In this area, NIST has been serving as a convener of the community to bring forth best practices and standards. NIST has led over 700 individuals, with representation from industry, government agencies, and academia, to form committees and subcommittees, facilitate communications, and develop a draft proposal for a reference

architecture for the Big Data ecosystem. NIST is also focused on a common access platform to allow for data sharing and broad access. The area of data science measurement has many crossover benefits that will add to the successes of the other two areas. Some of these data science challenges that need to be addressed to build any type of software to support Big Data include the ability to perform data cleaning, alignment, fusion, and prediction and estimation tasks.

Mr. Black provided examples of where software quality has negatively impacted people, including the Toyota braking and unintended acceleration difficulty and the 2010 flash crash of the stock market. Mr. Black highlighted NIST's work in software quality. NIST established the software assurance reference data set and collected and characterized almost 200,000 programs to allow for the development of software quality and assurance tools and testing products. NIST conduct in-depth studies and provide feedback to the tool makers so they can improve the tools and techniques that are built into the next version of software.

Discussion:

- The stakeholders and consumers of these research areas.
- Investments made in these ever-changing technology areas.
- Outreach to support understanding of NIST's work and tools in this research space.

Future Direction & Trends in Information Technology - Daniel A. Reed, Vice President for Research and Economic Development and the Professor of Computer Science, Electrical and Computer Engineering, and Medicine at the University of Iowa, Paul Ammann, Associate Professor, Software Engineering, George Mason University

The VCAT heard from a panel of external speakers working in the information technology field.

Dr. Ammann outlined trends he sees coming for the industry and how NIST can support these emerging and expanded trends. These include:

- Advanced Technology – from autonomous vehicles to 3D printers – it is changing quickly and what do standards mean and how will they be useful.
- Ubiquitous Updates - no more “finished products. Each company has a different approach to updates, standardization and best practices are needed.
- Quality – how to make quality routine. Quality problems often turn into security issues.
- Market forces – demand for security, privacy, and reliability.
- Usability – balancing the security and privacy against effectively and efficiently using the systems and software.

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

Dr. Reed shared his views on emerging trends and the disruptions from advanced technology. He outlined how the slowing of the changes to the size and scale of computing may impact the ability to improve computing performance and require functional specialization. There is a growing need to develop an adaptive spectrum sharing system to support increased use of mobile devices. Privacy issues to allow for a better definition of “access” to information, not a simple yes or no to whether one can gain access. Big data is a space where big is being underestimated. The data volume is enormous and continues to grow rapidly. Different technical solutions are needed to address the challenges and opportunities.

Discussion:

- In the area of big data, the need to sort of the good, useful data from the noise.
- U.S. competitiveness in this area and the need to ensure the skill set is available in the U.S. to support changing technologies.

VCAT Elections and Administrative Business

The Chair, Tony Haymet, will finish his final term on the VCAT in August 2015. The VCAT voted unanimously for Roberto Padovani to serve as interim Chair from August 31, 2015 to March 31, 2016.

There were no public comments offered.

The VCAT discussed the October 2015 meeting and expressed interest and agreement in holding the meeting in the Charleston, SC area in order to visit the Hollings Marine Laboratory and partner organizations.

Adjournment

The meeting was adjourned at 11:25 a.m. on June 10, 2015.

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

Karen Lellock, Executive Director, NIST Visiting Committee on Advanced Technology

Dr. Darlene Solomon, Vice Chair, NIST Visiting Committee on Advanced Technology