NIST Global Engagement

Mechanisms and Strategic Opportunities

Session Agenda: NIST Global Engagements

- **Context Setting and Examples of Current NIST Global Engagements**

  Willie E. May, Acting Under Secretary of Commerce for Standards and Technology and Acting NIST Director

  Discussion

NIST Mechanisms for International Engagement

International engagements can help provide and advance:

- Research and advancement of measurement science that contribute in significant ways to the economy of a country which includes the basic infrastructure required to support trade and commerce.
- Provision of internationally-recognized calibration and measurement capabilities - a critical element of social and economic development.
- Provision of internationally-recognized documentary standards – with critical input reflecting needs/opinions of sectors of various countries

NIST International engagements support the NIST and DOC Missions through numerous mechanisms at international

- **Stakeholder Perspective**

  Joe Bhatia, President and Chief Executive Officer (CEO), American National Standards Institute (ANSI)

  Discussion

- **Stakeholder Perspective**

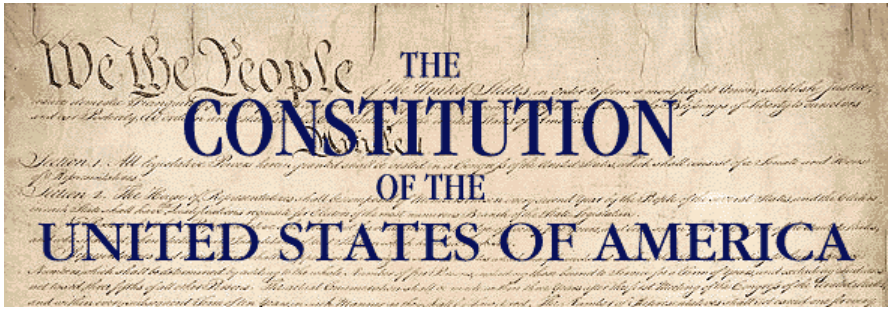
  Lonnie Spires, President USA Operations, Trescal

  Discussion

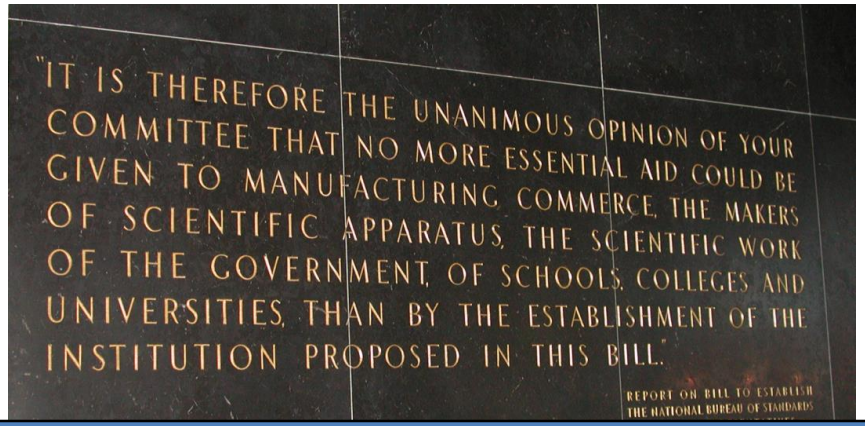
National Institute of Standards and Technology (NIST)

- Non-regulatory agency within U.S. Department of Commerce

- Founded in 1901 as National Bureau of Standards



Article I, Section 8: The Congress shall have the power to …*coin money, regulate the value thereof, and of foreign coin, and fix the standard of weights and measures*



***Unique Mission within the Federal Government* …**

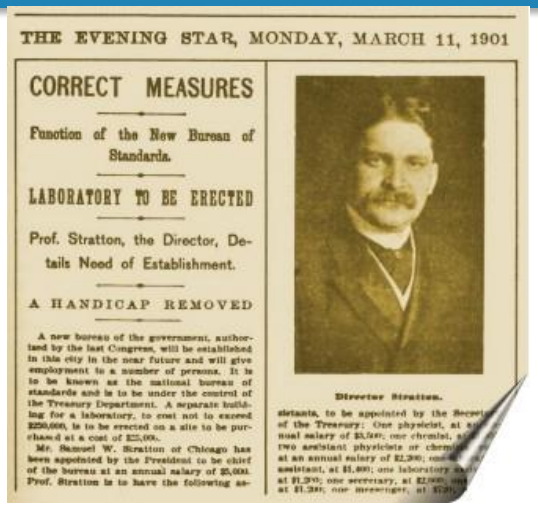
to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life

NIST (NBS) established in 1901

"It is therefore the unanimous opinion of your committee that no more essential aid could be given to

- **manufacturing**
- **commerce**
- **the makers of scientific apparatus**
- **the scientific work of Government**
- **schools, colleges, and universities**

than by the establishment of the institution proposed in this bill."



THE EVENING STAR, MONDAY, MARCH 11, 1901

CORRECT MEASURES

Function of the New Bureau of Standards.

LABORATORY TO BE ERECTED

Prof. Stratton, the Director, Details Need of Establishment.

A HANDICAP REMOVED

A new bureau of the government, authorized by the last Congress, will be established in this city in the near future and will give employment to a number of persons. It is to be known as the national bureau of standards and is to be under the control of the Treasury Department. A separate building for a laboratory, to cost not to exceed $250,000, is to be erected on a site to be purchased at a cost of $25,000.

Mr. Samuel W. Stratton of Chicago has been appointed by the President to be chief of the bureau at an annual salary of $5,000. Prof. Stratton is to have the following as-

Director Stratton.

sistants, to be appointed by the Secretary of the Treasury: One physicist, at an annual salary of $3,500; one chemist, at an annual salary of $3,000; two assistant physicists or chemists, at an annual salary of $2,500; one assistant, at $1,400; one laboratory assistant, at $1,200; one secretary, at $2,000; one messenger, at $720.

House Committee on Coinage, Weights and Measures … on the establishment of the National Bureau of Standards (now NIST) May 3, 1900

Organic Act of 1901; Updated in 2008

Functions and activities of the Institute include:

- **custody and dissemination of national standards**
  - **comparison of US national standards with those of other nations**
- **determination of physical constants and the properties of materials,**
- **solutions to measurement and standards problems of other government agencies**
- **providing (Innovation) assistance to industry**

International Engagement Helps Support and Advance:

- the Nation's economy through research and advancement of measurement science
- Social and economic development through internationally recognized calibration and measurement capabilities
- U.S. competitiveness through internationally recognized documentary standards with critical input from U.S. stakeholders as well as those of other countries
- U.S. foreign policy objectives
- More efficient delivery of research advances and measurement services through collaborations where appropriate

NIST Engages Internationally through:

Courtesy:lifemilewallpaperz.blogspot.com/

International Metrology and Standardization Organizations

Courtesy:defencenews.in

Agreements with Specific Countries

Activities with other Federal Govt. Agencies

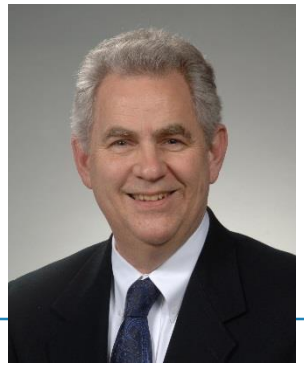
Courtesy:www.livescience.com

Scientist and Laboratory Level Staff Interactions

NIST Senior Leadership Team

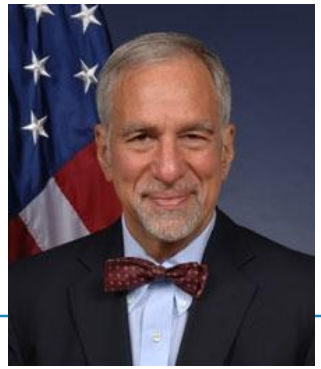
Willie E. May (Acting)
Under Secretary of Commerce for Standards and Technology
NIST Director

Associate Director for Laboratory Programs



Richard Cavanagh (Acting)

Associate Director for Innovation and Industry Services



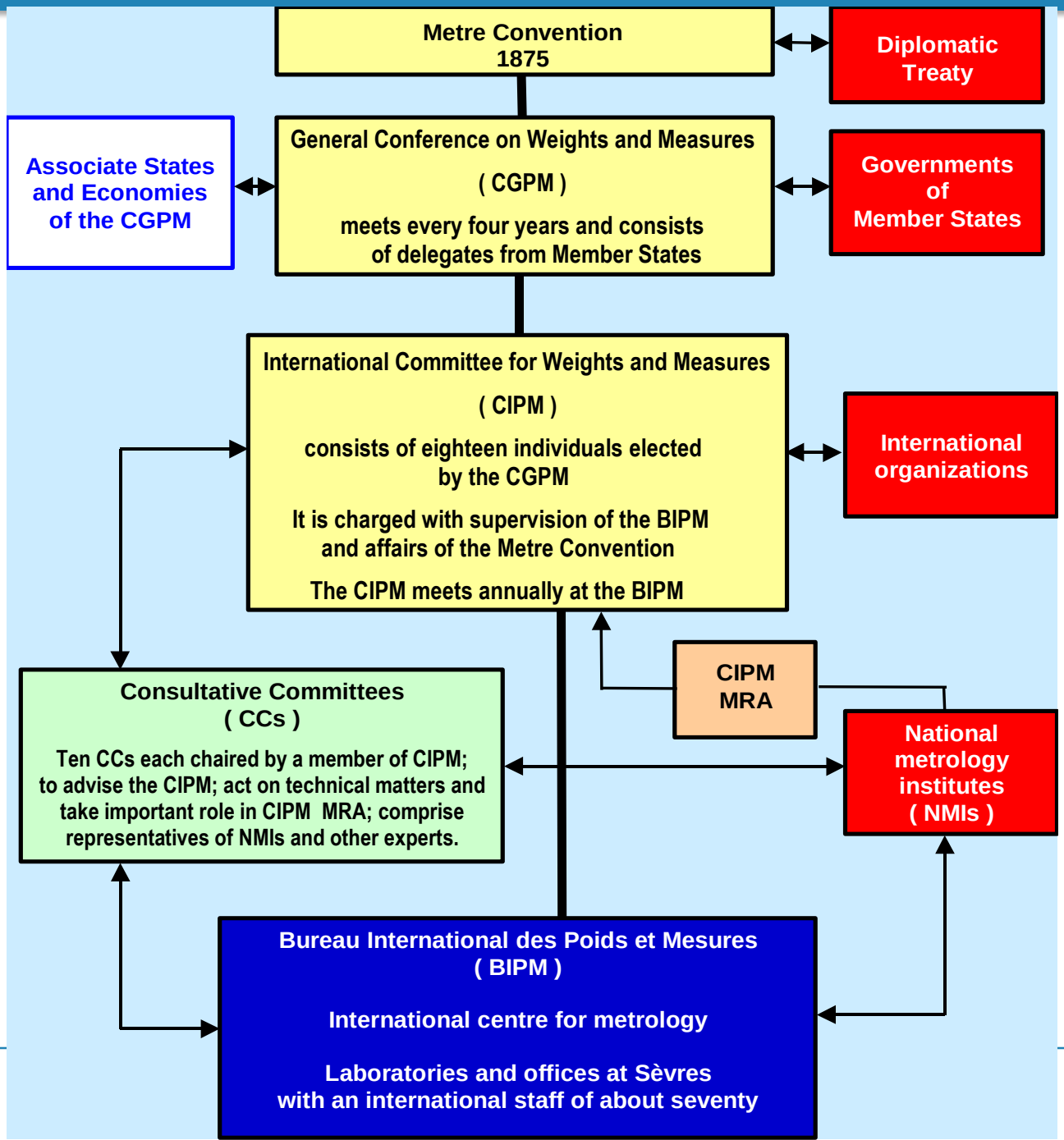
Phillip Singerman

Associate Director for Management Resources

Mary Saunders

Engagement through International Metrology and Standardization Organizations, e.g.,

- **Metrology:**
  - The International Committee on Weights and Measures Mutual Recognition Arrangement (CIPM MRA)
  - Inter-American System of Metrology (SIM)
  - Versailles Projects on Advanced Materials and Standards (VAMAS)
- **Documentary Standards and Conformity Assessment**
  - International Organization for Standardization (ISO) & International Electrotechnical Commission (IEC)
  - International Laboratory Accreditation Cooperation (ILAC)
- **Trade and Export**
  - Standards in Trade (SIT) Program
  - World Trade Organization (WTO) Technical Barriers to Trade (TBT) Committee


Metre Convention
1875
Diplomatic Treaty
Associate States and Economies of the CGPM
General Conference on Weights and Measures
(CGPM)
meets every four years and consists of delegates from Member States
Governments of Member States
International Committee for Weights and Measures
(CIPM)
consists of eighteen individuals elected by the CGPM
It is charged with supervision of the BIPM and affairs of the Metre Convention
The CIPM meets annually at the BIPM
International organizations
CIPM MRA
Consultative Committees
(CCs)
Ten CCs each chaired by a member of CIPM; to advise the CIPM; act on technical matters and take important role in CIPM MRA; comprise representatives of NMIs and other experts.
National metrology institutes
(NMIs)
Bureau International des Poids et Mesures
(BIPM)
International centre for metrology
Laboratories and offices at Sèvres
with an international staff of about seventy

CIPM

- **The CIPM is composed of 18 individuals, each from a different State, elected by the CGPM** and charged with providing direction and supervision of the BIPM and its activities along with all metrological work that the Member States decide to execute in common. In their capacity as members of the CIPM they therefore act within the framework decided by the CGPM and not on behalf of their own Governments. **Whilst CIPM members are elected on the basis of personal merit, it is important that they have some connection to the national measurement systems in their respective States and the support of their governments to serve in this capacity.**
- **Commencing with the 25th CGPM, each Member of the CIPM will be elected to a 4-year term or a term that spans the time between CGPMs; whichever is shorter.**
- **Existing members can be re-elected following the same nomination and selection process as new members.**

102nd CIPM, June 2013

Current CIPM Members (2015)

CIPM bureau members:

President	Dr B. Inglis (Australia)
Secretary	[Vacant]
Vice-President	Dr W.E. May (United States of America)
Vice-President	Dr J.W. McLaren (Canada)

CIPM members-elect:

Bowsher, Brian	United Kingdom
Brandi, Humberto	Brazil
Bulygin, Fedor	Russian Federation
Buzoianu, Mirella	Romania
Castelazo, Ismael	Mexico
Duan, Yuning	China
Erard, Luc	France
Inguscio, Massimo	Italy
Kang, Dae-Im	Rep. of Korea
Liew, Thomas	Singapore
Louw, Wynand	South Africa
Richard, Philippe	Switzerland
Rietveld, Gert	Netherlands
Ullrich, Joachim	Germany
Usuda, Takashi	Japan

ex officio Dr M.J.T. Milton (United Kingdom), Director of the BIPM

the **CIPM** has set up a number of **Consultative Committees**

to serve as advisers on scientific and technical matters. Among the tasks of these Committees are the detailed consideration of advances in science that directly influence metrology and the identification, planning and execution of key comparisons of national measurement standards. NIST has membership on all ten CC's and provides leadership of the CCQM [WEM is CCQM President]

Consultative Committees to the CIPM

- **CCAUV:** Consultative Committee for Acoustics, Ultrasound and Vibration
- **CCEM:** Consultative Committee for Electricity and Magnetism
- **CCL:** Consultative Committee for Length
- **CCM:** Consultative Committee for Mass and Related Quantities
- **CCPR:** Consultative Committee for Photometry and Radiometry
- **CCRI:** Consultative Committee for Ionizing Radiation
- **CCT:** Consultative Committee for Thermometry
- **CCTF:** Consultative Committee for Time and Frequency
- **CCU:** Consultative Committee for Units
- **CCQM:** Consultative Committee for Metrology in Chemistry and Biology

CIPM Mutual Recognition Arrangement

… was established in 1999 in response to a growing need for an open, transparent and comprehensive scheme to give users **reliable quantitative information on the comparability of national metrology services** and to provide the technical basis for wider agreements negotiated for **international trade, commerce and regulatory affairs**.

- Originally signed in by directors of NMIs of 38 member states of the Metre Convention
- It formalized existing *ad hoc* relationships, especially in the international chemical measurements community
- The MRA has now been signed by the representatives of over 97 institutes

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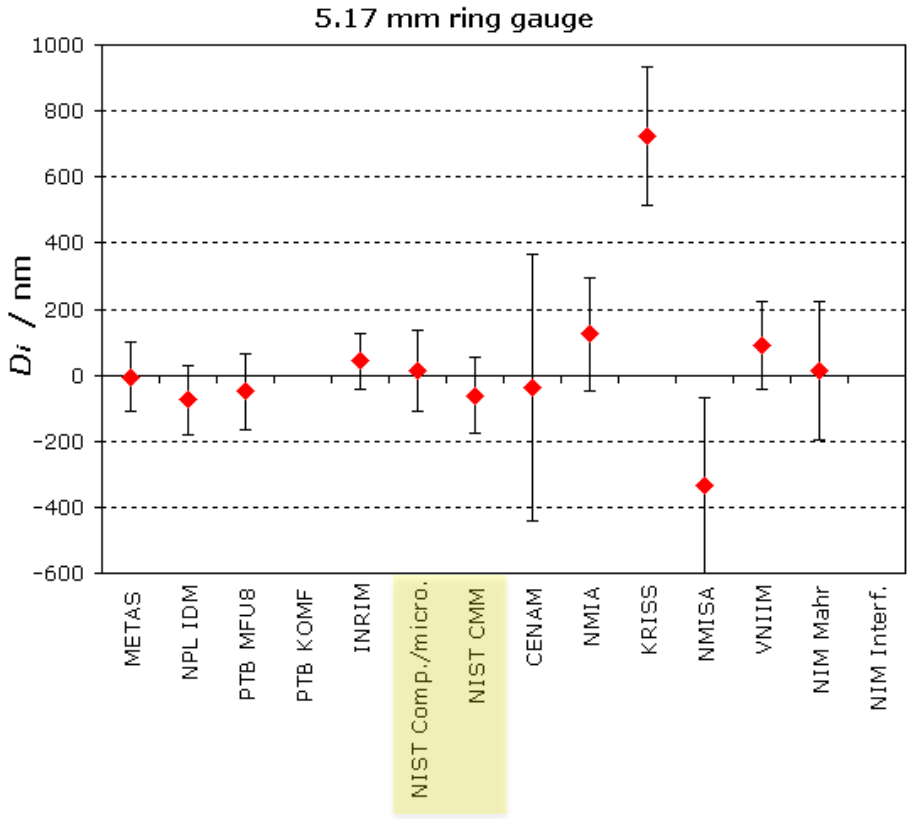
Requires:

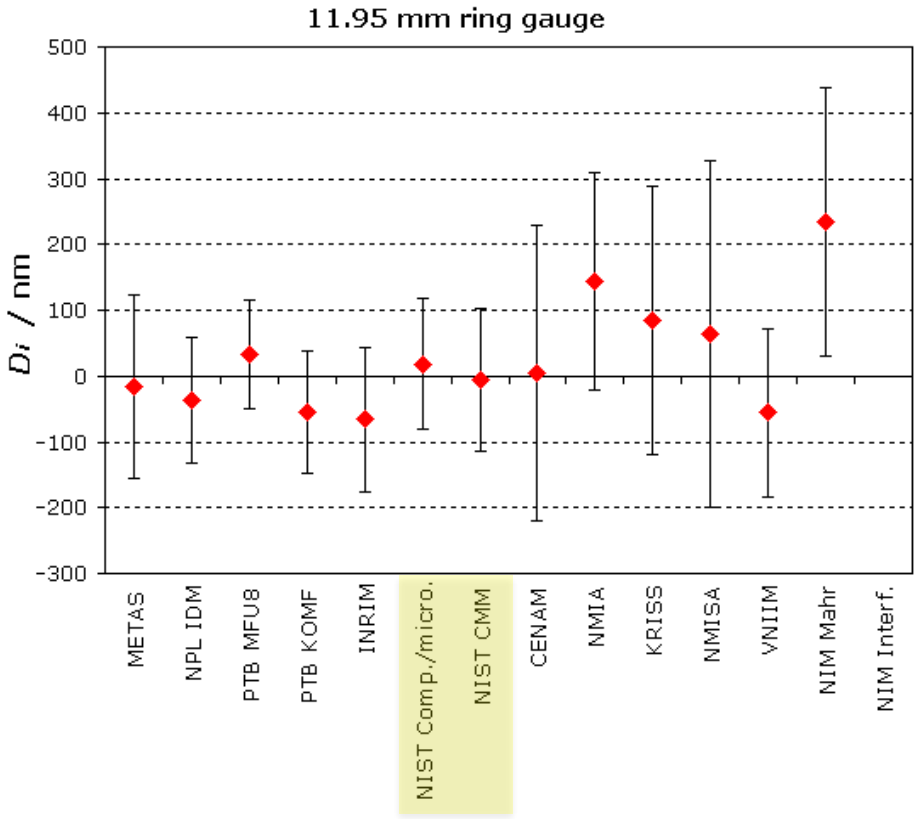
1. **Declaring and documenting calibration and measurement capabilities (CMCs)**
2. **Evidence of *successful* participation in formal, *relevant* international comparisons**
3. **Demonstration of system for assuring quality of each NMI's measurement services *(more and more, Peer Reviews used to assess)***

NIST Activities in Support of CIPM MRA

- **Documentation of our capabilities for measurement service delivery**
  - NIST has **~2,200** of the ~24,000 Calibration and Measurement Capabilities (CMCs) published in the CIPM MRA Appendix C .
- **Key Comparisons**
  - NIST has participated in **~390** Key Comparisons since the inception and has been the coordinating laboratory for over 90 of these
- **Quality Systems for our Measurement Services is formally Internationally-recognized**

CCL-K4.a: Diameter Standards (Steel Ring Gauges)





CCT-K6 Comparison of Humidity Standards: Dew and Frost Point Temperatures

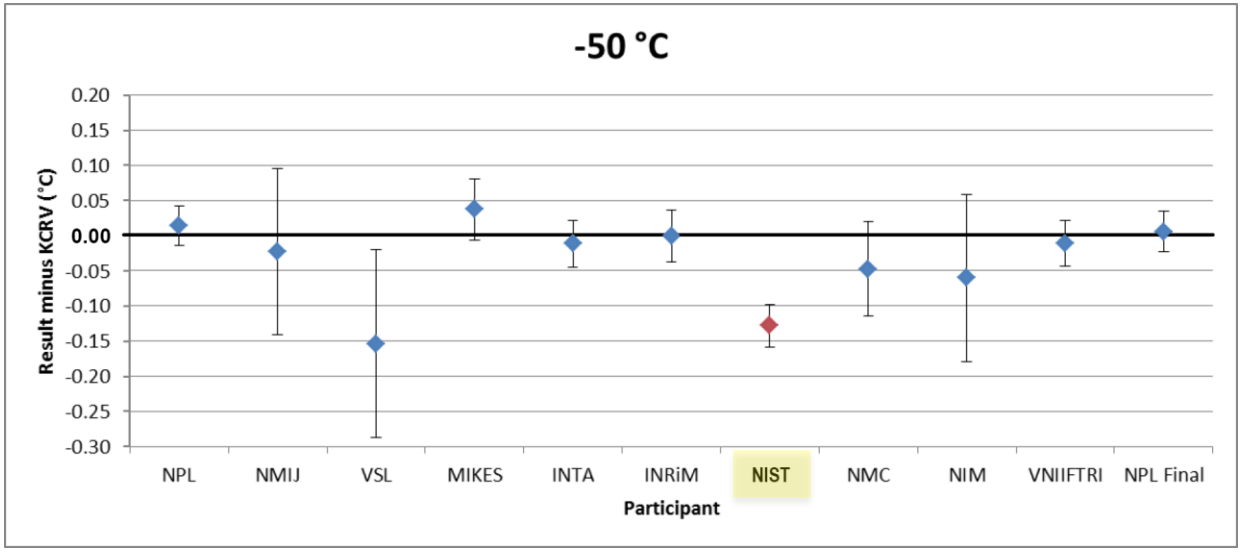
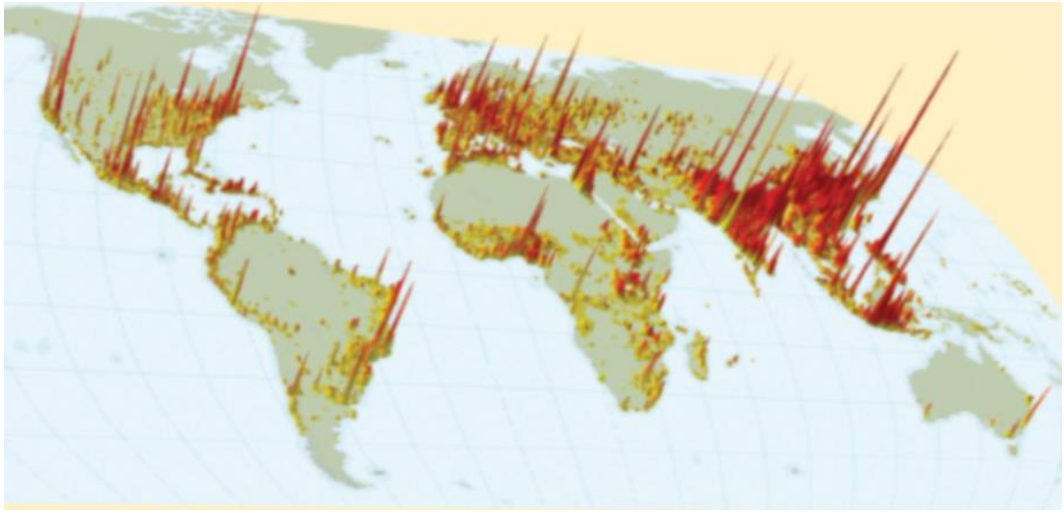


Figure 7.1 from Draft B of Report (in progress). Difference between participant results and KCRV, at the nominal frost-point temperature –50 °C. Error bars show the expanded uncertainties at coverage probability of 95 %. Estimated uncertainty due to instrument drift is included. "NPL Final" values are shown but not included in evaluation of KCRV.

These results led to an overhaul of the measurement service.

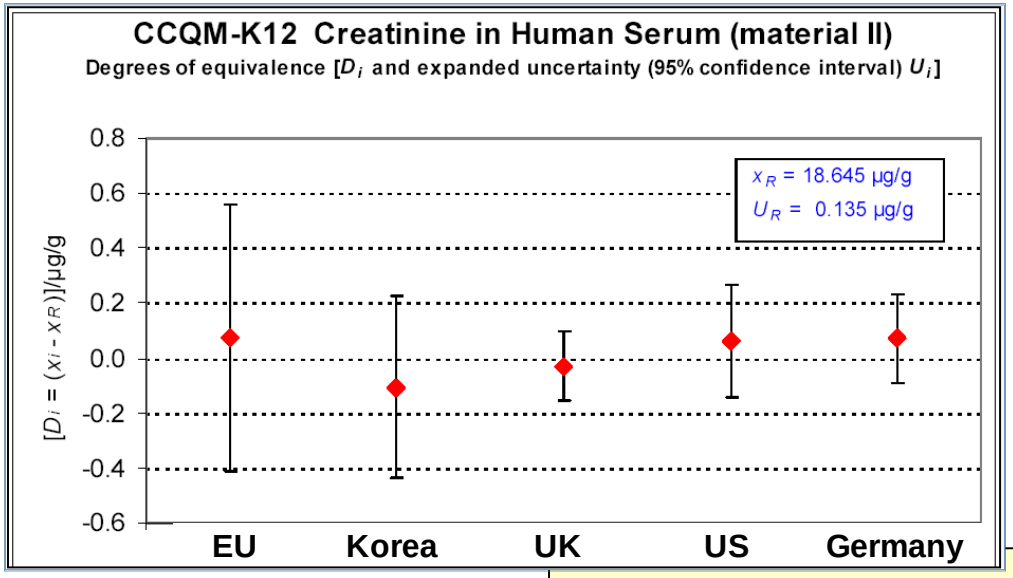
CIPM MRA activities enable NIST to identify “spikes” in the increasingly “flat world” and establish strategic collaborations for both research and standards development purposes.

Better services for our customers



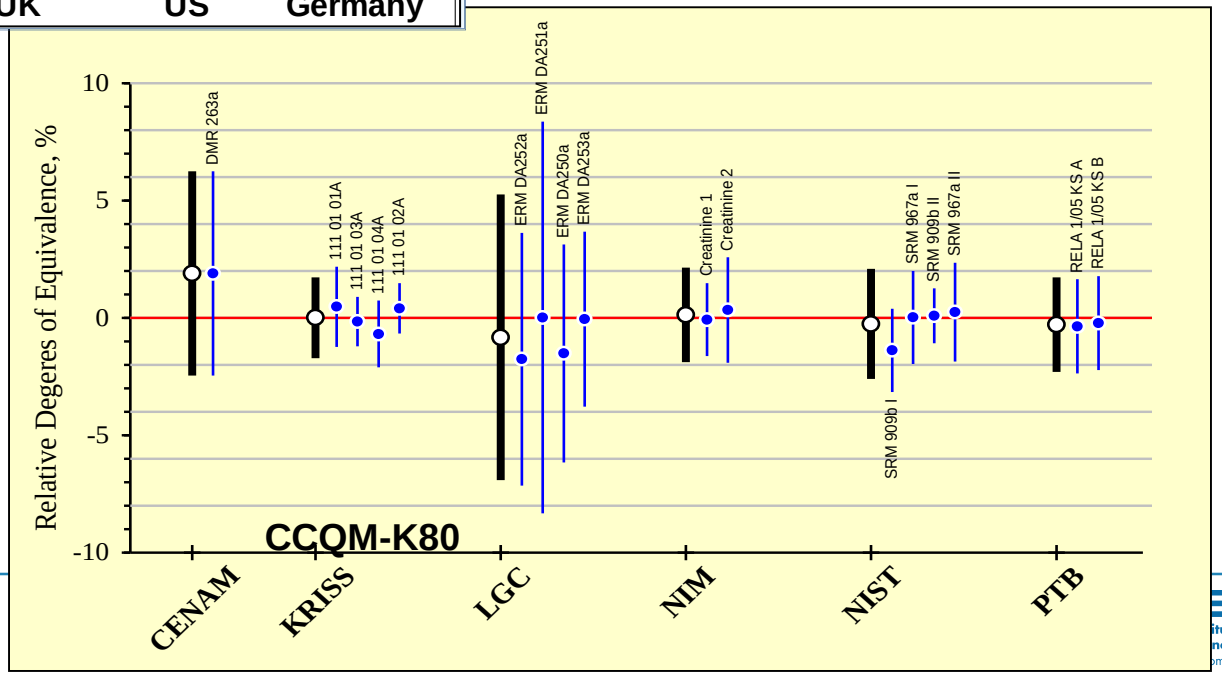
Graphic Source: “The World is Spiky” by Richard Florida, published in The Atlantic Monthly, October 2005

Leveraging NIST Participation in CIPM MRA Activities to better serve our customers



Documented degree of equivalence of measurement capabilities *(that could be used to identify collaborators in delivery of NIST measurement services)*

Comparison of value-assigned CRMs for Creatinine in Serum *that could be used to better manage NIST SRM renewal activities)*



Inter-American Metrology System (SIM)

- Resulted from a broad agreement among national metrology organizations from all 34 member nations of the Organization of American States (OAS).
- Created to promote international, particularly Inter-american, and regional cooperation in metrology, SIM is committed to the implementation of a Global Measurement System within the Americas, in which all users can have confidence.

13 SIM Technical Committees

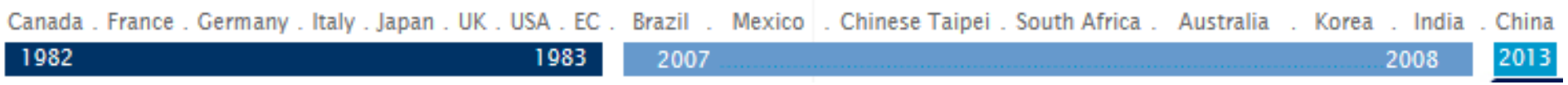
- Electricity and Magnetism
- **Photometry and Radiometry**
- Thermometry
- **Length**
- **Time and Frequency**
- **Ionizing Radiation and Radioactivity**
- Mass & Related Quantities
- Chemistry (Amount of Substance)
- Acoustics, Ultrasound and Vibration
- Flow and Volume
- Legal Metrology Working Groups
- Quality System
- **Statistics and Uncertainty**

http://www.sim-metrologia.org.br/

Bold = chaired by NIST staffer

Versailles Project on Advanced Materials and Standards (VAMAS)

VAMAS supports world trade in products dependent on advanced materials technologies, through International collaborative projects aimed at providing the technical basis for harmonized measurements, testing, specifications, and standards.



- Representatives from NMIs and Materials Institutes Worldwide
- Umbrella for fostering and organizing pre-normative research: International Inter-Laboratory Comparisons
- Expertise and Advice for Communities of Practice
- Formal agreements with Standards Development Organizations, such as ISO. Recognized by CCQM/BIPM
- Extensive track record of standing up standards from PNR

NIST and VAMAS

- Acting Associate Director of Laboratory Programs Richard Cavanagh Served as the VAMAS Chair from 2012-2014.
- NIST has a voting position on the VAMAS Steering Committee
- NIST is helping to co-organize a VAMAS-CIPM workshop in 2015 to map out areas of cooperation on materials standards
- NIST staff lead VAMAS technical working areas in Nanoparticle Populations, Scanning Probe Microscopy, and Thermoelectric Materials, and will lead one in Adsorption Materials
- In addition, NIST staff contribute to TWAs in Organic Electronics and Database Interoperability

http://www.vamas.org/

Engagement through International Metrology and Standardization Organizations: Documentary Standards and Conformity Assessment, e.g.,

- International Organization for Standardization (ISO) & International Electrotechnical Commission (IEC)
- International Laboratory Accreditation Cooperation (ILAC)

NIST involvement:

- **NIST researchers lend their expertise to 1,000 + standards-related activities**
- **100 + technical committees**
- **Approx. 400 staff**
- **Leadership in ANSI, ASTM Intl., IEEE, ISO, IEC, etc.**
- **Helps facilitate provision of input by private sector as well as other government agencies**
- **800 + laboratories accredited by NVLAP**

Ryan McVay/Getty Images

Engagement through International Metrology and Standardization Organizations: **Trade and Export**

- Standards in Trade (SIT) Program
  - The SIT workshop program provides opportunities for cooperation and information exchange on important topics related to standards and conformity assessment and provides for input from U.S. industry
  - most recent workshop held in September, 2014 brought together key U.S. and Indian government officials and industry representatives from the ICT sector together for a 4 day workshop focusing on cybersecurity, cloud computing, trusted identity, and national identities.
- World Trade Organization (WTO) Technical Barriers to Trade (TBT) Committee: USA Inquiry Point and Notification Authority
  - NIST hosts the USA Inquiry Point and Notification Authority for the WTO Agreement on Technical Barriers to Trade (TBT).
  - The Inquiry Point fulfills a critical trade role by:
    - distributing all member WTO TBT notifications of proposed foreign technical regulations to thousands of U.S. industry, government, and trade stakeholders via its web-based e-mail registration service.
    - Processing comments from U.S. stakeholders on other WTO member notifications

Collaborations with Other Federal Agencies

- International Measurements and standards related engagements are often an element of broader programs led by other U.S. agencies
- Lead agencies look to NIST to provide specific expertise needed, but not resident, in other agencies
  - **Recognition of the important role of metrology, standards and related R&D**
- These collaborations support many strategic and emerging foreign policy objectives
- Examples:
  - Commercial Dialogs and Standards dialogs led by International Trade Administration (Brazil, India, Israel, etc.) with emphasis on information exchange about standards for specific sectors or technologies
  - Joint Commission Meetings (JCMs) in Science and Technology Cooperation led by Office of Science and Technology Policy and the State Dept. include participation by NIST where NIST labs have significant engagements and/or expertise and interest
  - Provide standards, measurement or scientific input to Office of the United States Trade Representative on addressing specific trade concerns due to potential regulatory action by foreign trading partners

Scientist and Laboratory Engagement

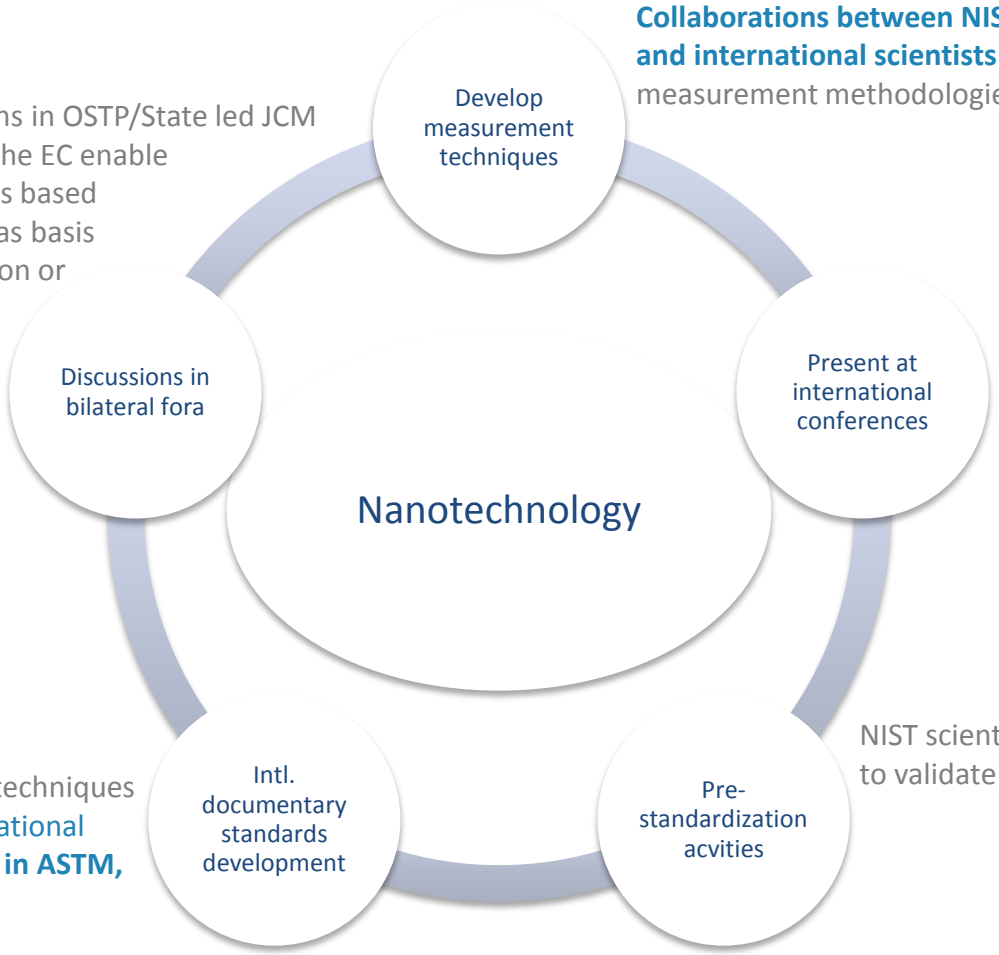
- Bottom-up driver for international engagement
- Emphasis on building strong technical ties with foreign experts in areas of mutual interest
- Enables NIST collaborations with leading experts from around the world
- In many instances, provides access to unique expertise not otherwise available in the U.S.
- Promotes long-term and sustained research collaborations

- Examples:
  - Foreign Guest Researcher Program – approx. 800 technical experts from over 70 countries per year at NIST for periods from a few weeks to multiple years
  - International Visitor Program – Visits that highlight NIST work to foreign visitors – over 3000 visitors from 70 countries annually.

Often, several types of engagements are used for an issue in a specific sector/technology – Example of synergistic benefits

Collaborations between NIST technical OUs and international scientists – results in measurement methodologies

Other Agencies: Discussions in OSTP/State led JCM or bilateral meetings with the EC enable discussions about standards based measurement techniques as basis for technological cooperation or trade related regulations



Scientist to scientist: Technical papers presented at international conferences highlight NIST work to international audiences, provides NIST feedback about international developments

NIST scientists participate in **VAMAS** to validate measurement techniques

Validated measurement techniques Form the basis for international **documentary standards in ASTM, ISO and IEC**

Issues to Explore

- What aspects should NIST consider when deciding whether to engage in discretionary international activities?

- Are there key or emerging issues that call for new and/or enhanced international engagement by NIST?

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- **Context Setting and Examples of Current NIST Global Engagements**

  Willie E. May, Acting Under Secretary of Commerce for Standards and Technology and Acting NIST Director

  Discussion

- **Stakeholder Perspective**

  Joe Bhatia, President and Chief Executive Officer (CEO), American National Standards Institute (ANSI)

  Discussion

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