World Metrology Day

Metrology
Measurements in a dynamic world

World Metrology Day
20 May
www.worldmetrologyday.org
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Greetings! I hope you are enjoying the return of spring and some nice weather in your neck of the woods.

It was a pleasure to see and talk with many NCSL International members, attendees and instructors at our Technical Exchange in February in Jacksonville, Florida. From my experience, I think the Technical Exchange is getting better every year! If you have not had a chance to attend, I encourage you to do so in 2017!

One of the benefits of being active in NCSLI is the opportunity to work with and get to know many great people who are the technical and business leaders in our field. At the February board meeting it was my pleasure to recognize three such people. Lonnie Spires, Jim Kaylor and Vernon Alt rotated off the board after providing many contributions and years of service to NCSLI. Although I regret to see them leave the board, I also welcome three new board members, Greg Strouse (NIST Representative), Bill Miller (Central US Division VP), and Tony Reed (Western US Division VP). Please join me in welcoming Greg, Bill and Tony to the NCSLI Board of Directors.

World Metrology Day is just around the corner on May 20, so I hope you are planning some kind of event or recognition at your company. This year’s theme is “Measurements in a Dynamic World.” More information is available at worldmetrologyday.org.

I encourage you to participate in this year’s Workshop & Symposium, with the theme “Measurement Accuracy and the Impact on Society,” which will be held at the Saint Paul RiverCentre in Saint Paul, Minnesota on July 24-28, 2016. The technical program, tutorial program and full conference information is available on the NCSLI website at ncsli.org.

As I have mentioned in my previous articles, the Board is focusing on seven key objectives as outlined in our strategic plan, 2020 Vision. Our fifth objective is to Encourage Education and Outreach. Hy Tran was appointed the new NCSLI Learning and Development VP. Hy is working with all the Learning and Development committee chairs to increase the impact of education, training, and outreach activities. They are discussing the current impact of their activities, and how NCSLI could have a greater impact in the future. If you are interested in supporting our Learning and Development activities please contact Hy Tran.

Thanks for all your contributions to NCSLI and I look forward to seeing you in Saint Paul!
Welcome New Members

NCSL International Membership opens doors to personal growth and career advancement

**ALLTITE, INC.**
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Alltite Inc. is the ultimate one-stop shop for calibration services, tool purchases, tool trailer rentals, total asset management software (Torqueware), and bolting procedure software (ITITE) for leak free projects in the gas compression/pipeline, chemical and refinery plants.

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Bayer is a Life Science company with more than a 150-year history and core competencies in the areas of health care and agriculture. With our innovative products, we are contributing to finding solutions to some of the major challenges of our time. The growing and increasingly aging world population requires improved medical care and an adequate supply of food. Bayer is improving people’s quality of life by preventing, alleviating and treating diseases. And we are helping to provide a reliable supply of high-quality food, feed and plant-based raw materials.

**NATIONAL PHYSICAL LABORATORY (NPL)**
NPL Management LTD.
Hampton Road
Teddington, Middlesex TW11 OLW
United Kingdom
Contact: Alexandra Barker
+44-(0)20-8943-6602
alexandra.barker@npl.co.uk

The UK National Physical Laboratory (NPL), as an integral part of its measurement research capability, develops highly accurate metrology facilities, instrumentation, sensors and artefacts. These products, based on those operated at NPL, are available to Industry, Large Science, Government and Academic laboratories throughout the world. NPL products support the development of measurement infrastructure and enabling scientific innovation.

**QUALER**
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San Diego, CA 92121
Contact: Michael Morozov
858-335-2470
michael@qualer.com

Qualer is on a mission to advance quality outcomes for all. We provide a cloud based asset management and calibration service platform designed to answer the hardest compliance and calibration challenges faced by our industry. Qualer helps calibration service providers and regulated organizations work together within a collaborative ecosystem built on the principles of metrology. Qualer is designed to meet the standards of ISO 17025 accredited organizations, CFR21 Part 11 regulations, and is validated under GAMP 5. Working from our headquarters in the heart of the San Diego life sciences cluster, we support the quality outcomes for hundreds of organizations around the United States and beyond.

**TAKEDA PHARMACEUTICAL COMPANY, LTD.**
9450 Winnetka Avenue North
Brooklyn Park, MN 55445
Contact: Patrick Rasset
763-255-5441
patrick.rasset@takeda.com

Located in Osaka, Japan, Takeda (TSE:4502) is a research-based global company with a focus on pharmaceuticals. As the largest pharmaceutical company in Japan, and one of the global leaders of the industry, Takeda is committed to strive towards better health for people worldwide through leading innovation in medicine. Takeda’s Brooklyn Park Facility is a mammalian cell culture manufacturing plant located in Brooklyn Park, Minnesota.
The theme chosen for 2016 is Measurements in a Dynamic World. This reflects both the challenge of accurately measuring dynamic quantities, for example the pressures in a combustion chamber, and the rapid pace of change in measurement science today.

Across the world, national metrology institutes continually advance measurement science by developing and validating new measurement techniques at whatever level of sophistication is needed. They also participate in comparisons coordinated by the Bureau International des Poids et Mesures (BIPM) to ensure the reliability of measurement results worldwide. The BIPM also provides a forum for its Member States to address new measurement challenges.

Many measuring instruments such as continuous weighing machines, radars for measuring vehicle speed, etc. that are used to measure objects in motion are subject to legal requirements or to regulatory control. Additionally, new technologies constantly change both the way in which these instruments make measurements and the methods needed for their control—“smart” meters for energy or water are one example. The International Organization of Legal Metrology (OIML) develops International Recommendations, the aim of which is to align and harmonize requirements for these types of instruments worldwide.

World Metrology Day recognizes and celebrates the contribution of all the people that work in intergovernmental and national organizations throughout the year on behalf of all.
WORLD METROLOGY DAY

Messages from the BIML and BIPM Directors

Martin Milton, Director of BIPM

When we reflect on the rapid pace of change in the 21st century, we may say that “the only thing that is constant is change itself”. The needs for metrology, and how these needs are met, are no exceptions; it is a challenge to bring the benefits of a stable and accurate measurement system to a dynamic world.

Many of the needs of society are met by new technologies, and it is essential that stable and accurate measurements are available to underpin them.

The accurate knowledge of dynamic quantities is pivotal to progress in high technology whether it is the high-speed movements in a disk drive, the variations in supply and demand from renewable energy sources on electricity grids, or the drive for environmental improvement and fuel efficiency in the aerospace industry. Dynamic quantities also play an increasing role in established industries, such as the dynamic weighing of trains and trucks, and the monitoring of vibration and impact arising from the tires and engines of cars.

These applications of dynamic measurement bring particular challenges. Linking highly accurate long-term stable standards to dynamic in situ measurements in everyday applications is difficult and itself requires great innovation.

Adapting our measurement capabilities to a dynamic world requires other steps too. The need to ‘future proof’ the International System of Units (the SI) is one of the key drivers for the redefinition planned for 2018. The changes will ensure the benefits of greater universality of the world’s measurement system, and open new opportunities for scientific and technological advances in the future.

We all need dynamic people in dynamic organisations to address the challenges of measurement in a dynamic world.

Stephen Patoray, Director of BIML

As a mechanical engineer, the first thought that comes to my mind is that dynamics is a branch of applied physics, specifically the field of classical mechanics which is concerned with the study of forces and torques and their effect on motion. The study of dynamics falls under two categories: linear (quantities such as force, mass/inertia, displacement, velocity, acceleration and momentum) and rotational (quantities such as torque, moment of inertia/rotational inertia, angular displacement, angular velocity, angular acceleration and angular momentum). Very often, objects exhibit both linear and rotational motion.

Numerous instruments are utilized in “dynamic” legal metrology; some examples are:

- automatic weighing instruments, which can weigh items while in motion,
- electricity meters, which measure the flow of electrons,
- various types of instruments that measure the flow of water,
- the flow of various other liquids and gases, and
- taximeters.

In English, however, the word “dynamic” relates not only to motion but also to change.

One example that highlights this continuous and productive change which encompasses many different sciences (including metrology) and engineering disciplines is space travel. On December 17, 1903 the Wright brothers made the first controlled, self-powered sustained flight. On October 4, 1957, the USSR placed in orbit the Sputnik 1, the first artificial satellite of Earth. On July 20, 1969, the first manned lunar landing was achieved by the United States’ Apollo 11 mission. In 1998 the first components of the International Space Station (ISS), or habitable artificial satellite, were put into low Earth orbit. In 2012, NASA’s Curiosity succeeded in landing on and exploring Mars. More recently in November 2014 the ESA’s Rosetta mission landed its Philae probe on a comet.

In the metrology community we are now seeing significant changes related to the definition of certain SI units as work on the new definition of the kilogram nears completion. Research continues to be successful in refining values and equipment used in the definition and the mise en pratique of other SI units.

While metrology, the science of measurement, is as old as human civilization it continues to constantly change; it continues to see forward acceleration and it continues to be dynamic. It is truly a fascinating time to be a part of this very dynamic work that we call “metrology”.

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What is World Metrology Day?

World Metrology Day commemorates the signing of the Metre Convention on May 20, 1875. The international treaty also known as “The Treaty of Metre,” was signed by seventeen nations and set the framework for global collaboration within various industrial, commercial, and societal applications of metrology and the science of measurement, as well as coordinating the development of the metric system. The original treaty’s primary concern was related to mass and length measurement, but the treaty was revised in 1921 to cover all known physical measurements. In 1960, the metric system of measurement was redefined as the International System of Units (SI), which we have grown accustomed to in today’s world. The original aim and goals of the Metre Convention remain as vital and pivotal today as it was in its inception back in 1875. The Convention continues to provide the foundation for a coherent measurement system now and into the foreseeable future.

The 2016 poster was designed by VNIIMS (Russian Federation).

About the BIPM

The signing of the Metre Convention in 1875 created the BIPM and for the first time formalized international cooperation in metrology. The Convention established the International Bureau of Weights and Measures and laid the foundations for worldwide uniformity of measurement in all aspects of our endeavors, historically focusing on and assisting industry and trade, but today just as vital as we tackle the grand challenges of the 21st Century such as climate change, health, and energy. The BIPM undertakes scientific work at the highest level on a selected set of physical and chemical quantities. The BIPM is the hub of a worldwide network of national metrology institutes (NMIs) which continue to realize and disseminate the chain of traceability to the SI into national accredited laboratories and industry.

About the OIML

In 1955 the International Organization of Legal Metrology (OIML) was established as an Intergovernmental Treaty Organization in order to promote the global harmonization of legal metrology procedures with the Bureau International de Métrologie Légale (BIML) as the Secretariat and Headquarters of the OIML. Since that time, the OIML has developed a worldwide technical structure whose primary aim is to harmonize the regulations and metrological controls applied by the national metrological services, or related organizations.
2016 NCSLI WORKSHOP & SYMPOSIUM

MEASUREMENT ACCURACY and the IMPACT on society

July 24–28, 2016
Tutorial Program July 24–25
Exhibition Hall July 25–28
Technical Program July 26–28

Saint Paul RiverCentre | Saint Paul, Minnesota

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NCSL INTERNATIONAL | 5766 Central Avenue, Suite 150 | Boulder, CO 80301 | (303) 440-3339 | info@ncsli.org
**TUTORIAL PROGRAM REGISTRATION RATES**

**SUNDAY, JULY 24 & MONDAY, JULY 25**

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**FULL CONFERENCE REGISTRATION RATES**

**MONDAY, JULY 25 – THURSDAY, JULY 28**

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**EXHIBITORS**

- AccuMac Corporation
- Acucal, Inc.
- ACR Technical Services, Inc.
- Additel Corporation
- Alpha Electronics
- American Assoc. for Lab. Accreditation
- Ametek Test & Calibration Instruments
- Ametek Land, Inc.
- Andeen-Hagerling, Inc.
- ANSI-ASQ National Accreditation Board (ANAB)
- AOIP
- ASQ-MCQ
- AssetSmart
- Bionetics Corp.
- Burns Engineering, Inc.
- Bruel & Kjaer, North America, Inc.
- Conference on Precision Electromagnetic (CPFM)
- Cal Lab Solutions, Inc.
- Colorado Engineering Experiment Station Inc.
- Data Proof
- Esco Calibration Laboratory
- Exelon PowerLabs
- FaSTest, Inc.
- Flexim Americas Corporation
- Fluke Calibration
- Fowler Precision Tools
- Fox Valley Metrology
- GE Measurement & Control Solutions
- GEO Calibration, Inc.
- Guideline Instruments Limited Interface, Inc.
- International Accreditation Service (IAS)
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- OHM-Labs, Inc.
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- Pratt & Whitney Measurement Systems
- Precision Environments Inc.
- Qualer
- Quality Magazine
- Radian Research, Inc.
- Ralston Instruments
- RH Systems
- Rice lake Weighing System
- Sartorius Corporation
- SIKA USA
- Spektrix Calibration Systems
- Tegam, Inc.
- The Boeing Company
- The Modal Shop, Inc.
- Thunder Scientific Corporation
- Tovey Engineering, Inc.
- Transcat
- Transmille Calibration
- Trescal, Inc.
- Vaisala, Inc.
- Vibration Research Corporation
- Western Environmental Corporation
- WorkPlace Training
Jeremy Applen, Closing Keynote Speaker

Cannabis: The State of the Science

With the US cannabis market valued at $2.7 billion in 2014, the burgeoning cannabis industry is driving advancements across areas such as botanical medicine, medical devices, separations and analytical chemistry, manufacturing and quality management. This session will share examples of innovation while discussing opportunities and the need for interdisciplinary collaboration between industry, scientists and engineers. Attendees will gain an improved understanding of the complexities and opportunities in this rapidly growing industry.

Jeremy Applen entered the cannabis arena with a background in pharmaceutical research and development, including experience gained at Pfizer and the Department of Veterans Affairs Cooperative Studies Program Clinical Pharmacy Coordinating Center. Founding Page Analytical, New Mexico’s first state-approved Medical Cannabis Testing Facility, Jeremy worked with the New Mexico Department of Health, Medical Cannabis Program, in drafting regulatory guidelines and improving alignment with regulations utilized by the US Food and Drug Administration for analogous products. Since that time, he has worked closely with government regulators and numerous cannabis organizations both nationally and internationally, to resolve significant issues related to regulations, product quality and product safety. Jeremy is an ISO 17025:2005 assessor for the American Association of Laboratory Accreditation and has spoken throughout the US on topics such as the practical and technical issues faced by cannabis laboratories.

Ralph M. Paroli, Opening Keynote Speaker

Developing Quality Standards for Cannabis using the ASTM Approach

As more countries and states legalize the use of cannabis (for medical or recreational purposes), the need for normative and calibration standards becomes increasingly critical. For example, how do enforcement agencies know that the cannabis is natural or synthetic, how will they know how much THC is in the bloodstream, how will labelling be used to properly indicate THC content, how will the packaging be made child-proof (i.e., foods which contain THC), etc. Normative and calibration standards will be necessary to help address these issues. Normative standards help establish quality and test protocols while calibration standards help to ensure that a quality result is obtained.

ASTM International is a global leader in the development and delivery of voluntary consensus standards. There are over 12,000 standards developed by ASTM which are used worldwide to improve product quality and enhance health and safety. These standards are what help to bolster consumer confidence. ASTM International is recognized as a standards developing organization (SDO) in the US and Canada. With the help of an advanced IT infrastructure, standards are developed using contributions from international technical experts representing 140 countries. Members create the test methods, specifications, classifications, guides and practices that support industries and governments worldwide. Using this infrastructure and expertise will allow the regulatory community to have standards developed in an efficient timeline. ASTM International’s efficiency will help regulate the medical cannabis quality, differentiate between the various concentrations, and ensure that globally-accepted analytical techniques are available.

Dr. Ralph M. Paroli, C.Chem., is responsible for providing leadership and managing research activities. Since 2013, Paroli has served as R&D Director in Measurement Science and Standards at NRC. Prior to that, from 1998 to 2012, he served as director of Building Envelope and Structure, Institute for Research in Construction, where he had responsibility for the NRC research program addressing concrete materials durability and repair, wall and window systems performance, and thermal and moisture performance of materials and roofing systems. Paroli is the ASTM International 2016 Chairman of the Board. An ASTM International member since 1994, he has served on its board since 2011. He was the Chairman of Committee D08, and a member of D11 on Rubber and E60 on Sustainability. He has also served a term on the ASTM Committee on Standards which reviews and approves all technical recommendations for actions on standards.

Dr. Paroli is a member of the American Chemical Society, Chemical Institute of Canada, Association of Professional Chemists of Ontario, and the Society for Applied Spectroscopy.

Jeremy Applen, Closing Keynote Speaker

Cannabis: The State of the Science

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Benefits of Hands-on Training

Even with the many advances in the training industry, traditional formats remain viable and effective. Classroom or Instructor-led training remains one of the most popular training techniques. It is a personal, face-to-face type of training as opposed to computer-based training and other methods.

Training programs are more beneficial when they provide many opportunities for practicing a skill. Hands-on training means you get to use your hands to perform tasks. This training aims to make conditions as realistic as possible. The biggest benefit of hands-on training is the opportunity for repeated practice.
TECHNICAL PROGRAM | July 26 – 28

TUESDAY, JULY 26

SESSION 1

1A Amazing Stories of Measurement I
Measurement Science for Metals-Based Additive Manufacturing
Kevin Jurrens, National Institute of Standards and Technology (NIST)

1B Dimensional Metrology I
Some Significant Errors in ULMs That You Don’t Know About
Dr. Ted Doiron, National Institute of Standards and Technology (NIST)

On the Feasibility of Performing Line Scale Measurement on a High Accuracy Coordinate Measuring Machine
Wei Ren, National Institute of Standards and Technology (NIST)

1D Panel Discussion: Healthcare Metrology
New NCSLI RP-6 Calibration Quality Systems for the Healthcare Industries
Panelists: Walter Nowocin, Medtronic PLC; Joe Petersen, Abbott Laboratories; Howard Zion, Transcat, Inc; Finn Christensen, Novo Nordisk

SESSION 2

2A Amazing Stories of Measurement II
Avoiding One Click Meltdown: Electronic Health Record Safety Related Usability Standards
Dr. Lana Lowry, National Institute of Standards and Technology (NIST)

2B Dimensional Metrology II
Design, Construction and Calibration of a Temperature Monitoring System for Resistance Standards
Daniel Paseltiner, National Institute of Standards and Technology (NIST)

A Cryogen-free Table-top Primary Resistance Standard
Dr. Jan-Theo Janssen, National Physical Laboratory (NPL)

2D Panel Discussion: The Next Generation
Development of Early Career Professionals: Military and Industry

SESSION 3

3A Metrology Education
Three Decades of Metrology Education in Mexico
Roberto Benitez, ETALONS

Integrating a CMM into an Engineering Technology Class Utilizing Simulation and Hardware
Joseph Fuehne PhD, Purdue Polytechnic Columbus

Metrology Education at UNC Charlotte
Chris Evans PhD, UNC Charlotte

3B Mass/Force I
The NIST Magnetic Suspension Mass Comparator
Corey Stambaugh PhD, National Institute of Standards and Technology (NIST)

Measuring Mass in Vacuum Using Surface Artifacts
Patrick Abbott, National Institute of Standards and Technology (NIST)

The Design and Construction of the In-Vacuum Mass Exchange System for the Realization and Dissemination of the New SI Unit of Mass
Lenin Chao, National Institute of Standards and Technology (NIST)

3C Temperature I
The Impact of Pressure and Temperature upon the Modern Football
Kevin Radzik, Lead Scientist and Operations Manager, Alliance Calibration

Best Practices for Properly Using Thermometric Fixed-Point Cells as Calibration Reference Standards
Michael Coleman, Fluke Calibration

Qualifying a Check Standard for Infrared Thermometry Calibrators
Frank Liebmann, Fluke Calibration

3D Quality control
Remote Auditing: Love It or Hate It — Let’s Embrace It!
Guy Robinson, Tektronix, Inc

Instrument Models: Application and Benefits
Mark Kuster, Pantex Metrolgy

Creating a Standardized Schema for Representing ISO/IEC 17025 Scope of Accreditations in XML Data
David Zajac, Cal Lab Solutions, Inc.

WEDNESDAY, JULY 27

SESSION 4

4A Amazing Stories of Measurement III
The Linchpin in Medical Physics: Ionizing Radiation Measurements for Health Care
Lisa Karam, National Institute of Standards and Technology (NIST)

In Vivo Map-Making with Magnetic Resonance: Standards for Quantitative Imaging
Michael Boss, National Institute of Standards and Technology (NIST)

4B Pressure I
Analysis of Pressure Measurement Techniques from 1 kPa to 130 kPa
Jacob Ricker, National Institute of Standards and Technology (NIST)

Photonic Realization of the Pascal
Dr. Jay Hendricks, National Institute of Standards and Technology (NIST)

Recent Improvements in the Leak Comparison Service at the National Institute of Standards and Technology
Greg Scace, National Institute of Standards and Technology (NIST)

4C Temperature II
A Review of in-situ Temperature Measurements for Additive Manufacturing Technologies
Ryan Murphy, Sandia National Laboratories

Transporting Frozen Vaccines Safely: Methods for Temperature Monitoring and Control
Michal Chojnacky PhD, National Institute of Standards and Technology (NIST)

Modeling Insulation Leakage Effects on Platinum Resistance Thermometer Performance
Michael Coleman, Fluke Calibration

SESSION 5

5A Amazing Stories of Measurement IV
Towards X-ray Vision: Compton Gamma Imaging at the NRCC
Patrick Saul, National Research Council Canada (NRC)

5B Pressure II
Use of Modern Leak Detectors for the Calibration of Leak Standards
Eric Forrest PhD, Sandia National Laboratories

Optimizing the Performance of the Compare II Leak Calibration System
Timothy Moss, Sandia National Laboratories

5C Electrical – AC
Influence of Adapters on AC-DC Difference Measurements
Dr. Stefan Cular, National Institute of Standards and Technology (NIST)

Multijunction Thermal Converters for AC Current Metrology
Thomas Lipe, National Institute of Standards and Technology (NIST)
SESSION 6
6A Strategic & Economic Evaluations at NMs
The Method of the Quantitative Assessment of the Economic Feasibility of Creating the Primary (reference) Measurement Standard
Dr. Pavel Neyezhmakov, National Scientific Center “Institute of Metrology”
Reflections on Strategy, Sustainability and Value Creation in NMs
Dr. Salvador Echeverria-Villagomez, Centro Nacional de Metrologia (CENAM)

6B Dimensional Metrology I
Utilizing Measurement Tools to Develop a Shrink Rule for the 3-D Printing Process
Joseph Fuenne PhD, Purdue Polytechnic Columbus
Dimensional Fidelity of Replica Casting Compound
Edward O’Brien, R&D S&I, Electrical Engineering, AC Laboratory / Sandia National Laboratories

6C Uncertainty Concepts
Characterization of Measurement Uncertainty and Figures of Merit for Biotin Quantification
Dr. Tobias Karakach, National Research Council of Canada (NRC)
Comparative Calculations to Evaluate Proposed Changes to the GUM
Russell Geisthardt, Keysight Technologies

6D Healthcare Metrology
Calibration in Regulated Industries: Federal Agency Use of ISO/IEC 17025 and ANSI/NCSL Z540.3
Paul Reese, Baxter Healthcare Corporation
Volumetric Accuracy of Pipettes in the Life Sciences Laboratory
George Rodrigues, Artel

SESSION 7
7A New Challenges/Developments
Advanced Measurement Dissemination for Thermodynamic Quantities
Gregory Stouso, National Institute of Standards and Technology (NIST)
Metrology of Navy Directed Energy Weapons
Dr. Subrata Sanyal, Naval Surface Warfare Center (NSWC), Corona Division
Issues and Strategies for Improving Measurement Uncertainties for Solid-State Lighting
Joanne C. Zwinkels PhD, National Research Council of Canada (NRC)

7B Mass/Force II
System for Traceable Calibration of Nanonewton Forces and Force vs. Deformation Curves
Dr. Jan Schlecht, Technische Universität Ilmenau
Design of a Table-top Watt Balance
Stephan Schlamminger PhD, National Institute for Standards and Technology (NIST)
Design of Digital Controllers for Electromagnetic Force Compensated Balances Focused on the Disturbance Transfer Function
Norbert Rogge, Technische Universität Ilmenau

7C Metrology Potpourri
Characterization of the NIST Magnetic Suspension Mass Comparator Apparatus and Facility
Edward Mulhern, National Institute of Standards and Technology (NIST)

SESSION 8
8A Amazing Stories of Measurement V
Transforming Welding with Comprehensive Metrology
Dr. Marla Dowell, National Institute of Standards and Technology (NIST)

8B Dimensional Metrology II
Extension of Calibration Capabilities for the NIST Hybrid Humidity Generator
Christopher Meyer, National Institute of Standards and Technology (NIST)
Extending Oscilloscope Bandwidth Calibrations to 27GHz
Paul Roberts, Fluke Calibration

8C Microwave
Traceability of Vector Network Analyzer Calibration Kits
Eric Smith, Keysight Technologies
Modeling the Effect of Noise Source Mismatch on Y-Factor Noise Figure Measurement Uncertainty
Kan Wang, Keysight Technologies

8D Conformance Testing
Conformance Decision Rules to Support ISO/IEC CD 17025 Under Revision
Robert Stern, Keysight Technologies
Understanding the Test Measurand and the Profound Impact on Calibration, Verification, and Uncertainty
Jim Salsbury PhD, Mitutoyo America Corporation

SESSION 9
9A Global Standards/Traceability
Promulgation of New and Improved Measurement Knowledge Through Standards Development
Andy Oldershaw, National Research Council Canada (NRC)
The Laboratory Committee of the International Laboratory Accreditation Cooperation
Steve Sidney, National Laboratory Association - South Africa
Worldwide Measurement Traceability Challenges from an OEM Support Point of View
Jorge Martín, National Instruments Corporation

9B Security & Cyber
Zener Reference Standards: Myth vs Reality
Jeff Gust, Chief Metrologist, Fluke Calibration
The Metrology Behind Wideband/RF Improvements to the Fluke Calibration 5790B
Milen Todorakev, Metrologist, Fluke Calibration
Calibration of Optical Fiber Time Domain Reflectometers in Accordance with IEC 61749-1:2009
Samuel Ko, Electronics Engineer, Standards and Calibration Laboratory

9C Electrical III
Best Lessons Learned from FDA Calibration-related Warning Letters
Walter Nowocin, Medtronic
Calibration of Electro-Cardio Graph Simulators
Samuel Ko, Electronics Engineer, Standards and Calibration Laboratory
Measurement Uncertainties in the Calibration of Climatic (Humidity) Chambers
Cesar (Jun) D. Bautista, Jr., PhD, Masy BioServices Inc.
Implementation of the New Defense Standard VG96910
Documentation of Calibration Services
Gerhard P. Mihm – German Armed Forces Calibration Organization

Pressure Transducer Sensor Design and Application
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Up to 50 GHz Microwave Frequency Measurement Using Down-Convert Technique at Telecommunication Laboratories, Taiwan
Chia-Shu Liao – Chief Researcher, CHT Telecommunication Laboratories

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Michael Mende – SPEKTRA Schwingungstechnik und Akustik GmbH

Uncertainty Evaluation of Profile Projector Calibration
Yi-Ting Chen – Quality Assurance Engineer, Center for Measurement Standards/Industrial Technology Research Institute

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Oelof Kruger – National Metrology Institute of South Africa

Investigating the Characteristics of Measurement Tools during the Break-In Period
Joseph Fuehne PhD – Purdue Polytechnic Columbus

Economic Utilization Cost Model
Phillip T. Chase – Chairman, AssetSmart

Computer Aided Calibration of Voltage and Current Surge Generator in Accordance with IEC 61000-4-5:2014
Samuel Ko – Electronics Engineer, Standards and Calibration Laboratory

Application of High-Power RF Flow Calorimetry to Power and Voltage Calibration
Andrew S. Brush – TEGAM, Inc.

The Influence of Measurement Uncertainty in Conformity Assessment
I-jhen Lin – Accreditation Officer Taiwan Accreditation Foundation (TAF)

Development of Educational Prototypes of the SI Base Units
Julio Diaz – Profesor Investigador de Tiempo Completo Universidad Politecnica de Santa Rosa Jauregui

Reference Value for Budgeting by Bayes Estimates
Ding Huang – Mathematical Statistician US Department of the NAVY

Effect of Humidity on Low Voltage Power Supplies
Dr. Cesar (Jun) Bautista – Masy BioServices Inc.

Building a World-Class Metrology Lab in 182 Days
John Masiello – Masy BioServices

Uncertainty Score Card with Economic Estimations
Dr. Salvador Echeverría-Villagómez, Centro Nacional de Metrologia (CENAM)

Navy Efforts in Directed Energy Weapons: Importance of Metrology and Calibration
Dr. Subrata Sanyal – Naval Surface Warfare Center (NSWC), Corona Division

Awards

Best Paper Awards
Editor’s Choice Award
Scholarship Awards

Sponsor Track

Amazing Stories of Measurement
POSTER SESSION II | Wednesday, July 27 | 12:15 PM – 1:00 PM

- The Global Position System Environmental Stress Screening Test
  Nghiem Nguyen, PhD – Raytheon Space and Airborne System

- The Top 5 Challenges Calibration Laboratories Are Facing During Accreditation Process
  George Anastasopoulos – International Accreditation Service (IAS)

  Michael J. Kramer – Perry Johnson Laboratory Accreditation, Inc.

- Calibration of Infrasound Measurement Devices
  Michael Mende – SPEKTRA Schwingungstechnik und Akustik GmbH

- A Novel Approach in Using Proficiency Testing Data to Validate CMM Software for the Regulated Industry
  Anish Shah – Chief Metrology Officer, Metrologized, LLC

- Development of a Virtual Metrology Laboratory with Adaptable Modules
  Julio Diaz – Profesor Investigador de Tiempo Completo Universidad Politecnica de Santa Rosa Jáuregui

- Combined Instruments for Test Efficiency
  Tim Coonan – Software Engineer, National Instruments Corporation

- Millimeter-size Monolayer Epitaxial Graphene for Next Generation Resistance Standards and Future Electronic Applications
  Dr. Yanfei Yang – National Institute of Standards and Technology (NIST)

- Expand Capacitor and Inductor Frequency Range Using a Dependent Correction
  Dimaries Nieves – Senior Metrology Engineer, National Instruments Corporation

- Introduction to the Status of Interlaboratory Comparison on Reference Photovoltaic Cell Calibration at Center for Measurement Standards in Taiwan
  Min An Tsai – Center for Measurement Standards/Industrial Technology Research Institute (CMS/ITRI)

- Accelerometer Calibration Verification with TEDS Capability
  Andy Cogbill – Application Engineer, Vibration Research

- Calibration Due Dates – Daily or End of the Month?
  Harry C. Spinks – Business Consultant, TechTrology LLC

Exhibitor Welcome Reception
Monday 6:00 PM - 8:00 PM
Exhibit Hall Open to Public Thursday 10:00 AM - 1:00 PM

Keynote Breakfast Luncheon Buffet Networking Committee Meetings

Metrology Mixers
Tuesday 4:00 PM - 5:30 PM
Wednesday 4:00 PM - 5:30 PM
Ice Cream Social
The 2016 Technical Exchange was yet another successful training event hosted by NCSL International. This year’s Tech Exchange took place February 1-2, 2016 in Jacksonville, Florida. Measurement science professionals from across the US, and varying industries, came to participate in our metrology courses and hands-on tutorials. We would like to thank all participants for making this year’s Technical Exchange such an informative and impactful experience. This educational event once again provided a foundation and forum for participants to exchange ideas, techniques, innovations, and experiences in the fields of metrology and measurement science.
Instructors

Dawn Cross, NIST

Frank Liebmann, Fluke Calibration

Charles Ellis, NAPT

David Cirullo, Mettler Toledo

John Wright, NIST

Bryan Wilkerson, Trescal

Ian Ciesniewski, Mettler Toledo

Hy Tran, Sandia National Laboratories
Over the course of the two day event, 16 courses were held covering everything from industrial platinum resistance thermometry and fundamentals of force calibrations to proficiency testing and RF sensor calibrations. Each course was developed by NCSLI members and supporters representing great companies and organizations such as Additel Corporation, A2LA, E=MC3 Solutions, Tegam, Fluke Calibration, Mettler Toledo, Morehouse Instruments, Guideline Instruments, NAPT, NIST and Sandia National Laboratories. On Monday and Tuesday, Technical Exchange Exhibitors provided information on their respective companies and equipment while discussing test and measurement challenges with attendees. Exhibitors this year were Ametek, Essco Calibration, Additel Corporation, Guideline Instruments, NAPT, Technical Maintenance Incorporated (TMI), Measurements International, and Sapphire Proficiency Testing.
The primary goal of the Technical Exchange continues to be providing metrology and measurement science courses that are accessible to individuals across all skill levels. As the annual Tech Exchange grows each year, our goal is to always further NCSLI’s mission of providing the best opportunities for measurement science experts by ensuring that each Tech Exchange continues to be a resounding success. At this time we are currently looking for companies and instructors for the 2017 Tech Exchange to be held in Orlando, Florida on January 23 - 24, 2017 at The Florida Hotel & Conference Center. These educational development events would not be possible without the knowledge, passion, and dedication of NCSLI members and sponsors, so consider developing a course or holding an exhibit at next year’s Technical Exchange.
Ametek Corporation

Essco Calibration

Technical Maintenance Incorporated (TMI)

NCSL International

Measurements International

Sapphire Proficiency Testing

Guildline Instruments
The HPC40 Series is the world’s first combined pressure and mA loop calibrator to be fully temperature compensated from -20 to 50° C. You can count on the same accuracy whether measuring pressure, current, voltage, or temperature.

- 0.035% of Reading Accuracy
- Gauge, Absolute, and Differential Pressure to 15,000 psi / 1000 bar / 100 MPa
- Advanced Simplicity "Non-Menu" Interface
- Measure & Source mA with External Loop Power or Internal 24 VDC Power Supply
- High Accuracy Thermometer with “True Ohm” Technology
- Store & Recall Previously Used Screens
- Flexible Power Options Including Rechargeable
Two Days of Measurement Training Conducted by Experts in the Field of Metrology!

January 23 - 24, 2017 IN ORLANDO, FLORIDA

<table>
<thead>
<tr>
<th>PRICING AND REGISTRATION</th>
<th>Member</th>
<th>Non-Member</th>
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</thead>
<tbody>
<tr>
<td>1/2 Day Training</td>
<td>$180</td>
<td>$205</td>
</tr>
<tr>
<td>1 Day Training</td>
<td>$360</td>
<td>$410</td>
</tr>
<tr>
<td>2 Day Training</td>
<td>$720</td>
<td>$820</td>
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</tbody>
</table>

Registration Includes:
- Materials Bag
- Breakfast, Lunch and Expert Measurement Training for that day!

The NCSLI Technical Exchange will build and enhance specific hands-on skills in the calibration of measurement and test equipment. This two-day training will also teach best practices along with introducing new and innovative calibration hardware, software and calibration services. Each training session is taught by measurement science experts from throughout the industry.

Tabletop Exhibits Available
Today the modern measurement specialist faces new and exciting challenges from fields such as nanotechnology, where quantities are vanishingly small. In this and other fields, science continues to push the boundaries of common measurement techniques.

Nanoscale measurements with global implications

An interesting strategic research project at the National Research Council of Canada (NRC) brings together metrology researchers to develop and advance new techniques to measure, at the nanoscale, the composition of the air Canadians breathe. Their measurements pinpoint black carbon emissions from airplanes, trucks and ships in a dynamic environment.
“We are probing the emissions while the engine is running and under changing operating conditions so that we are building a map of the black carbon emissions as a function of engine performance,” says Dr. Kevin Thomson, Program Leader of NRC’s Measurement Science for Emerging Technologies program. “The verification and advancement of emerging measurement technologies – notably for sensitivity and specificity – is our challenge over the next several years.”

Accurate measurement of black carbon emissions is absolutely necessary to understanding and mitigating their health, environmental and economic impacts. Moreover, because black carbon plays a significant role in climate change, the measurement and monitoring of this substance is a Canadian priority in the context of international global warming agreements.

“We believe this project will show the important role that precision measurement can play in adjusting to the new reality imposed by climate change, as well as verifying emerging measurement tools which are essential for meeting regulatory challenges moving forward,” says Thomson.

Canada’s go-to RTO
As Canada’s go-to research and technology organization (RTO), the National Research Council and its work in measurement science and standards delivers solutions and technical services for a broad spectrum of industrial applications, both directly through work with industry and government clients, and indirectly through collaborative work with other NRC groups.
TIPS
Recognizing and Compensating for this Common Environmental Influence on Weighing

Static electricity can be considered “The Ghost in Lab” and can cause major problems with mass measurements on analytical balances:

- Electrically nonconductive objects, e.g. containers from borosilicate glass or plastic, are prone to electrostatic pick-up
- Charges build up mostly through separation of, or friction between, two bodies
- Dry powders, weighing paper, and plastic weigh boats are very susceptible to static charges

Reduce the influence of static electricity by:

- Putting the vessel into an electrically conducting container (shield)
- Using ionized air to discharge the object
- Asking experts in the weighing industry for solutions and countermeasures to reduce the influence of static electricity in your weighing process
Recognizing and Compensating for these Common Human Influences on Weighing

- Wind drafts from human movement near a balance
- Leaning on the table during weighing
- Tapping your foot against the table during weighing
- Leaving the doors open between weighings
- Not closing the doors on an analytical balance tightly
- Vibration from other activities being conducted around the balance
- Heat radiation from the human body

Reduce these human influences by:
- Creating an isolated area in the corner of the lab away from activity
- Having a table that is designated only for weighing
- Keeping your hands out of the weighing chamber whenever possible
- Keeping your hands at your side and feet under the table during weighing
- Standing still during weighing
- Closing balance doors tightly during and when finished with weighing
- Always closing balance doors between weighings

Knowing the Difference Between Smallest Net Weight in Your Weighing Process and the Minimum Weight of Your Balance or Scale

Smallest Net Weight is the smallest sample mass that you measure on your balance or scale and is based on your weighing process requirements.
- Smallest Net Weights should be clearly defined and discussed as a step in any weighing quality program.

Minimum Weight is the accuracy limit of your balances and scales and is based on the performance of your balances and scales in the environments they reside in as well as your weighing process tolerance requirements.
- Minimum Weight should be scientifically calculated by an approved method.

Assure your balances and scales are appropriate for the weighing processes they are being used for:
- Discuss and calculate The Smallest Net Samples being measured on your balances and scales in all weighing processes
- Have The Minimum Weight of each scale scientifically calculated by an approved service provider
- Create a “Safe Weighing Range”. All measured samples should be larger than the minimum weight that has been calculated for the balance or scale in use
- Consult with experts in the weighing industry for scientific solutions to assure accurate measurements in your weighing process
Pressure Sensor Technical Tips

Why Temperature Compensation Matters for Pressure Measurement

Jon Sanders
Additel Corporation
jon.sanders@additel.com

Have you ever wondered how much impact environmental temperature has on your pressure sensors? Nearly every pressure sensor has some sort of environmental temperature specification on its data sheet. This technical note explains the impact of environmental temperature effects on pressure sensors, quantifying the impact and ways to minimize the impact.

Why pressure sensors are impacted by environmental temperature changes

Much like anything else in the physical measurement world, pressure sensors are subject to changes in environmental conditions. Temperature effects tend to have the largest impact on pressure measurement accuracy. Temperature effects directly influence the pressure sensor and the circuitry used to measure the sensor. Digital pressure sensors use electronic circuits which provide an analog output proportional to the inlet pressure. There are three factors of a sensor’s circuitry that are affected by environmental temperature changes: zero pressure output voltage, pressure sensitivity span and bridge resistance. Temperature-compensated sensors employ some techniques to correct for and minimize the impact of temperature changes on these factors.

To understand the environmental temperature effect on your sensor, it is helpful to first understand some common terms you may see on a pressure sensor specification sheet.

Operating Temperature Range: This is the temperature range over which the sensor can be used without causing damage.

Temperature Compensated Accuracy Range: This refers to the environmental temperature range over which the accuracy of the sensor is applicable.

Temperature Coefficient: An additional error that needs to be considered when used outside of the temperature compensated accuracy range. Many sensors are only tested and calibrated at laboratory temperatures. In this case, the temperature coefficient will need to be considered in the measurement accuracy when using the sensor outside of laboratory temperatures.

Quantifying the environmental temperature effect

So how much will the ambient temperature impact your measurement accuracy? Well, this will depend on the temperature compensated accuracy range and the temperature coefficient. To demonstrate this, let’s consider three different gauges. As you can see from the specifications below (figure 1), they all have the same accuracy specification of 0.05% FS. However, as you consider the temperature compensated accuracy range and the temperature coefficient you’ll see a fairly large variation between the three gauges.

The following graph shows the total specified accuracy when considering the temperature effects on the pressure gauges. As you can see in one case here, the lack of temperature compensation and inclusion of the temperature coefficient specification more than triple the 0.05% FS accuracy specification.

<table>
<thead>
<tr>
<th>Manufacturer 1</th>
<th>Manufacturer 2</th>
<th>Manufacturer 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Accuracy</strong></td>
<td>0.05% FS</td>
<td>0.05% FS</td>
</tr>
<tr>
<td><strong>Temperature Compensated Accuracy Range</strong></td>
<td>N/A</td>
<td>15ºC to 35ºC</td>
</tr>
<tr>
<td><strong>Temperature Coefficient</strong></td>
<td>Add 0.003% FS/ºC from 23ºC</td>
<td>Add 0.003% FS/ºC: -10ºC to 15ºC, 35ºC to 50ºC</td>
</tr>
</tbody>
</table>
Temperature compensation test results

To further show temperature compensation has real effect, we placed a non-temperature compensated pressure gauge in a temperature chamber and pressure tested it from 0 to 580 psi (0 to 40 bar) and over the environmental temperature range of 0°C to 40°C. We then performed the same test on a temperature compensated gauge. As you may expect—the higher the pressure, the larger the impact from the environmental temperature. Below is a chart comparing the non-temperature compensated gauge with the temperature compensated gauge.

Temperature Compensation Effect

- Minimizing environmental temperature error
- The temperature effect on a pressure sensor will be negligible when used at the same laboratory temperature in which it was calibrated. This, however, is often not practical for many measurements.
- With sensor technology advances, we have found a variety of ways to minimize the temperature effect on pressure sensors and define a large temperature compensated accuracy range.
- First, regularly zero your digital pressure gauges. By zeroing the pressure gauge, you align the zero pressure output voltage to the current environmental conditions. You should only zero the pressure gauge when you do not have any inlet pressure on the gauge.
- Because each sensor is unique and performs differently due to environmental temperature changes it is advantageous that a pressure sensor is individually pressure tested at different temperatures so its pressure performance relative to environmental changes is understood and characterized.
- Advanced sensor technology may allow for temperature-compensated circuits to store coefficients representing the temperature testing of each individual gauge. This would allow you to confidently use the sensor over the temperature compensated range without having to add a temperature coefficient error to the accuracy.
Minimizing environmental temperature error
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Conclusion
The environmental temperature of a pressure sensor will affect both the pressure sensor and the sensor circuitry. This temperature effect can have a negative impact on the accuracy of a pressure gauge. When considering the true accuracy of a pressure gauge you should include the environmental temperature impact to the gauge by adding a temperature coefficient to the accuracy specification or using the gauge within its temperature compensated accuracy range. A regular zero of the gauge can help in minimizing the effect of environmental temperatures.
Georgette Macdonald (NRC representative) and Tim Osborne (VP Operations) attended with 16 other experts to review and respond to the 2,606 comments received from the ISO/CASCO member ballots of CD1. Due to the number of comments, only sections 5, 6, 7 and Annex A were reviewed and responses proposed during this meeting. Clauses were amended where clarification or correction was agreed by the DG. The balance of the document and any contentious issues were brought forward to the full Working Group meeting in Pretoria.

WG44 Meeting Pretoria, South Africa (February 15-18, 2016)
Jeff Gust (VP Standards & Practices), Georgette Macdonald (NRC representative) and Tim Osborne (VP Operations) attended with 66 other experts to review the recommended responses and updates from the DG meeting in January. In addition, the Working Group (WG) reviewed and commented on the balance of sections and any contentious issues not reviewed or resolved during January’s meeting in Geneva. Due to the number of comments and resulting improvements to the document, the WG agreed a second committee draft (CD2) was more appropriate than a Draft International Standard (DIS). CD2 was released for ballot and comment on March 24th.

Notable Points:
1. Ballot for sampling “Should the revised ISO/IEC 17025 be explicitly applicable to organizations that perform sampling without the subsequent testing or calibration?” 41 Yes, 39 No. WG44 decided not to make any significant changes to the Standard as a consequence of vote results.
2. Reorganized sections and clauses to establish a logical flow,
3. Addressed terminology inconsistencies between sections,
4. Changed focus to processes and risk management rather than requiring policies and procedures in most places,
5. Added more Terms & Definitions: intralaboratory comparisons, verification, working standard, laboratory, and decision rule,
6. Removed “method” from Terms & Definitions. The definition of method was removed from the definitions clause and a note was added into selection, verification and validation of methods that for calibration laboratories the term method can be considered synonymous with the term measurement procedure as defined by the VIM.
7. Changed the wording from:
8. “scope” to “laboratory activities”
9. “compliance” to “conformity” as it relates to measurement results
10. Expanded “Accommodation and environmental conditions” to “Laboratory activities and environmental conditions,”
11. Moved subcontracting from Resource Requirements (6.4.7 of CD1) to the Process Requirements section (7.1.2) but still meet the control requirements of 6.5 of CD2,
12. Simplified Traceability (6.6),
13. Overhauled the flow of Section 7 to be in line with the process flow in a laboratory,
14. Created a new section called Analysis of Results (7.7) that focuses on decision rules used to make statements of conformity by taking measurement uncertainty into account, and
15. Updated Annex A – Metrological Traceability to include sections on the definition, fitness for purpose, objective evidence, SI clarifications, and a special section on reference material traceability based on input from ISO 17034 WG43 Committee).

The Drafting Group is scheduled to review and respond to the comments of CD2 in mid-July and the Working Group to put the finishing touches on the next document in September. If all goes well, CD2 will enter the Enquiry Stage (40) and WG44 will publish the Draft International Standard (DIS) for review and ballot.

As a DIS, 17025 will be circulated to all of the ISO members, including mirror groups, for voting and comment. Unlike the Committee Stage (30), also known as the CD stage, The Enquiry Stage provides for a 3-5 month voting and commenting period. If two-thirds of the P-members of the ISO/CASCO Committee approve of the DIS and not more than one-quarter vote negatively, the DIS will be approved and move to the Approval Stage (50) as a Final Draft International Standard (FDIS).

Please use this link to identify the P-member representing your country:
http://www.iso.org/iso/home/standards_development/list_of_iso_technical_committees/iso_technical_committee_participation.htm?commid=54998
BOULDER, CO Two landmarks merged on Dec. 10, 2015, when the most advanced laboratory building at the National Institute of Standards and Technology (NIST) campus in Boulder, CO, was renamed after legendary NIST laboratory director Katharine Blodgett Gebbie.

This is the first time a NIST Boulder building has been named for a person. Such honors have been rare in NIST’s 114-year history across several locations. The last time a NIST building was named for a staff member was in 1962 at the institution’s original headquarters in Washington, D.C.

Gebbie, currently a NIST senior advisor, is uniquely deserving of such an honor. An astrophysicist by training, she has worked for NIST for more than 45 years. Among other positions, she directed two large NIST operating units of several hundred researchers each. Under her leadership, NIST staff won four Nobel Prizes in Physics between 1997 and 2012 as well as two MacArthur Fellowships, aka “genius grants.”

Gebbie also played leadership roles in founding NIST’s Summer Undergraduate Research Fellowship (SURF) program, the Joint Quantum Institute, and in advocating for women and minorities in science.

“This renaming is our small way of saying thank you, Katharine, for all you’ve done for this organization over such a long period of time,” said Under Secretary of Commerce for Standards and Technology and NIST Director Willie E. May. “This gesture will serve as a reminder for all of us for years to come who Katharine is, and was, and the remarkable environment that she fostered within NIST and the laboratories that she led.”

The renaming was celebrated at a ceremony where Gebbie was presented with many tributes—a standing ovation from an overflow crowd of about 200 staff and guests; a letter from Colorado Governor John Hickenlooper; and an American flag once flown over the U.S. Capitol in Washington, D.C., provided by local Congressman Jared Polis.
All four NIST Nobel laureates spoke glowingly and told personal anecdotes about Gebbie’s quest for excellence, as well as her loyalty and nurturing support that encouraged them to succeed—and remain at NIST throughout their careers.

“Katharine—we revere you, we are in awe of you, and we love you,” NIST Fellow and 1997 Nobel laureate William Phillips said.

A typical Gebbie response to such accolades is: “Of course, all I did was hire and retain talented scientists and support staff.” (She was unable to attend the ceremony in person.)

The renamed laboratory building, first dedicated in 2012, tightly controls environmental conditions such as vibration and temperature, as required for cutting-edge research and measurements with world-leading atomic clocks and other advanced technologies. The lab also offers capabilities for micro-and nanofabrication of custom research devices and advanced imaging systems. The building is intended to support NIST research needs for the next 50 years.

Although Gebbie spent most of her career based at NIST’s current headquarters in Gaithersburg, Md., she maintained her roots in Boulder. She began her NIST career as a postdoctoral researcher at JILA, NIST’s joint institute with the University of Colorado Boulder. Later, as a lab director, she was responsible for substantial programs at NIST Boulder and JILA.

“At JILA I learned there is no substitute for talent. Hire the highest caliber people, provide them the resources they need, and let them run,” Gebbie has said. “I never knew any other way of managing.”

She has fond memories of the Boulder Airport, where she learned to fly her mother’s airplane.

“My favorite trip was to take people over the Continental Divide and down the Colorado River to Lake Powell and the Grand Canyon. Hard to beat that for scenery. And I still have a house in Boulder at 7,000 feet with a view in one direction to the Divide and in the other to Kansas—including, of course, the Boulder Airport.”

The Blodgett in Gebbie’s name recalls her famous aunt, Katharine Burr Blodgett, who invented low-reflectance, invisible glass that is the prototype for coatings used today on camera lenses.

On December 2, 2015, U.S. Senator Ben Cardin paid tribute to Dr. Katharine Blodgett Gebbie and the naming of the building in her honor. Read the Congressional Record transcript of that tribute.
June 9, 2016 marks World Accreditation Day as a global initiative, jointly established by the International Accreditation Forum (IAF) and the International Laboratory Accreditation Cooperation (ILAC), to raise awareness of the importance of accreditation.
Accreditation determines the technical competence and integrity of organizations offering conformity assessment services such as testing, certification, inspection and calibration based on international standards. Accreditation can thus be used to verify compliance with a standard. Accreditation is an impartial and objective process carried-out by third-parties; it offers the least duplicative, the most transparent and the most widely accepted route for the provision of credible and trustworthy conformity assessment results.

Standards, accreditation and conformity assessment are market-based tools that can be used by Government policy makers to deliver better regulation, environmental protection, public safety, fraud prevention, fair markets and public trust. These tools are not as widely known and understood, or used, as they should be. However, there are many instances around the world where the public sector has embraced accredited conformity assessment as a means of delivering public policy objectives.

This year’s theme focuses on how accreditation can be a global tool to support public policy for all areas in the public sector – national and local government regulators. To help explain the use of accredited conformity assessment, the Public Sector Assurance website has been established to showcase different global examples where accreditation has been used to support public policy efforts.

As in previous years, the day will be celebrated across the world with the hosting of major national events, seminars, and press and media coverage, to communicate the value of accreditation to governments, regulators, and the leaders of the business community.

For local events near you, please contact your local accreditation body.
For information on how to celebrate or to download the poster and brochure templates for use in other languages, ILAC members can log in at.
View this article online.
The New England Region held its spring meeting on April 21 in the town of Pepperell, Massachusetts. A quaint little town with a population under 12,000 and home to one of the three covered bridges in Massachusetts that is open to public motor vehicle traffic. Our host was Masy BioServices, a provider to the pharmaceutical, medical device, biotechnology, and regulated industries markets. Breakfast was provided compliments of ProTEQ Solutions.

Our first speaker was Adam R. Fleder, President of TEGAM. There were two distinct calibration challenges presented, and Adam detailed how TEGAM addressed each. Adam described how TEGAM established a traceability path for a 9 kHz to 18 GHz RF standard (a range that is beyond the range of NIST’s calibration service) at 1mw. This first need arose as customers have RF power sensors they wish to calibrate down to 9 kHz, yet NIST does not maintain a standard for RF Power below 100 kHz. Adam indicated the process was “started with the end in mind.”

So, without a directly traceable measurement available, a convergence of several individual elements was required. In determining the available and relevant alternative measurements consideration was given to physical dimensional, temperature, DC, low frequency, and RF components. For this low power application, TEGAM utilized a matched thermistor pair in the RF signal path. The required level of measurement uncertainty was evaluated and obtained at each step along the way. Error sources evaluated included contributors of impedance, AC voltage DC sensor and mismatch measurement.

The second need was to produce a NIST traceable system to calibrate Bird Technologies© model 43 watt meters and similar items. There have been more than a million of these devices made, and they are used in the industrial, scientific, and medical fields. This required the development of a 100W RF standard that operates between 250 kHz and 1 GHz. This challenge included consideration of additional error sources, to include RF mismatch, thermal leaks, thermopile nonlinearity, and coolant properties. The presentation provided great insight to TEGAM’s Innovative thinking with regard to traceable measurements. TEGAM now offers both calibration services and systems to address both challenges.
The podium was next handed over to Cesar D. (Jun) Bautista, Jr. PhD, Senior Director of Laboratory Operations at Masy BioServices for the presentation on a “New Concept in the Calibration of Climatic Chambers.” As a starting point, the traditional types of humidity devices were presented and measurement uncertainty principles reviewed. As measurement of RH is complex compared to many other parameters, RH has a high measurement uncertainty. In more depth, the uncertainty elements for the different measurement techniques and systems were explored. Systems include dew-point generators, chilled mirror hygrometers, impedance hygrometers. A newly designed (GEO Test) portable secondary standard and its measurement principles were presented. Tests done by Masy BioServices illustrated that the new design meets many of the most stringent market demands.

Our afternoon kicked off with Joe Brown, an Electrical Engineer from Northeast Marketing. Northeast Marketing are the Fluke representative in New England for electrical products. Joe gave an introduction to the group on the safety category (1 through 4) ratings for electrical test equipment and accessories. It was illustrated how important it is to use the right tools for the job. For high energy circuits, Category 4 rated (and tested) equipment should be used. This is because high energy feeds can provide an ideal path for a transient spike (such as could occur with a lightning strike to an outside power line. The transient can then result in an arc blast. Arc blasts can be disastrous events. They cause more electrical injuries every year than the more familiar hazard of electric shock.

Category 4 circuits are the “origin of installation,” where low-voltage connection is made to utility power. Some examples or category 4 circuits include:
- Electricity meters and primary overcurrent protection equipment
- Outside and service entrance, service drop from pole to building, or the run between revenue metering and panel
- Overhead line to detached building or an underground line to well pump

Although these circuits are not the typical environment of the average metrologist, many of the electrical meters being calibrated today bear these safety category ratings. It can be a lifesaving detail to not let an end user “roll out” to a job with a category 4 meter...but only category 1 test leads.

Our presentations were rounded out with Gus Gustafson. Many of you may have talked with Gus if you’ve ever...
called the technical support line at Mitutoyo! As part of his work with Mitutoyo, Gus also does teaching and outreach events at technical schools. Today's presentation topic was on the proper use and care of precision hand tools. Gus came prepared with a sampling of hand tools (calipers, micrometers, etc.), in addition to a list of do’s, don’ts, and tricks of the trade.

A staple in most manufacturing environments, precision hand tools are everywhere…and their basic care is often overlooked. One important and overlooked aspect is proper storage. Part of proper storage involves setting the instrument so that you are leaving an air gap between the measuring faces. This simple step can prevent corrosion on the critical surfaces. A little care and consideration of these precision hand tools bears fruit in reliable and repeatable measurements. It also increases the likelihood they’ll still be in tolerance when they came back for calibration. But knowing some of the rigors that hand tools face in the field was enlightening and informative from the calibration provider’s prospective.

At the day’s end, a tour of the newly expanded Masy BioServices facility was made available to the attendees. This was our second meeting at this facility, so members who were at both meetings got to see the “before and after” of the impressive renovations and new construction.

We thank our host, and all the presenters, for what was a very interesting and informative day to the over 25 industry professionals in attendance. Our next regional meeting is being planned for October 12 in Southbridge, MA (home of the Optical Heritage Museum).
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The Central Florida meeting was held April 12 at Lockheed Martin’s Orlando location within the Global Innovation Campus. Lockheed Martin provides defense systems and training simulation systems to the US Military. Breakfast and lunch was provided by Southern Marketing Associates (SMA). The meeting kicked off with Jeff Stevens, NCSL International Region Coordinator, giving an overview of upcoming events and the benefits of NCSLI membership followed by attendee introductions.

The first meeting speaker was Pat Butler, Regional Product Manager for Fluke Calibration. Pat possesses years of experience in the metrology field, including experience working with the US Marines. He gave two presentations during the meeting, the first was “Fluke Software Overview and Update” and the second was “Measurement Uncertainty Requirements in MET/CAL®.” Pat’s first presentation discussed end of life for MET/TRACK and MET/BASE, the new features of Fluke software for MET/TEAM data base management, MET/CAL® automated calibration procedures, Compass for pressure and flow, Tableware, LogWare III, and MET/TEMP II. Fluke Calibration has been in the software business for nearly 40 years, and over that time customer needs have evolved, so have Fluke products in response. The presentation gave an overview on where Fluke Calibration software is today, what options are available, and how it can help improve calibration laboratory or asset management activities.

The second presentation, “Measurement Uncertainty Requirements in MET/CAL®,” explored how calculating and reporting measurement uncertainty for each measurement point can be a daunting task whether done manually or using spreadsheets. Pat demonstrated how MET/CAL provides the tools to collect both type A and type B components and report an expanded uncertainty through several detailed examples.

Both of Pat’s presentations were very informative and generated many questions from attendees since most present used MET/CAL in their labs.

After lunch, the second meeting speaker was Michael L. Schwartz, Automation Engineer with Cal Lab Solutions. Michael also gave two presentations, one being an overview of Metrology.NET and the other a presentation on Open Badging.
The first presentation discussed was on “Metrology.NET,” which is a metrology based system of systems designed to bridge the gap between the multiverse of software tools currently used in calibration labs. As technology moves forward, metrology seems stuck in the past, but Metrology.NET aims to propel the industry into the future. Metrology.NET is a new modular approach to automation and data collections based on proven technologies designed to be language, database, and platform agnostic.

The second was called “Open Badging” and examined how the distribution of plaque, awards, and diplomas is evolving within the digital age. Education is changing, and the next generation continues to live in a rapidly expanding digital world where acquired knowledge will soon be displayed on a virtual wall as opposed to a physical plaque or diploma one would find in their office. Open Badges provides an industry standard for displaying your knowledge, skills, and professional experience on various forms of social media.

Mike’s presentations were also very informative and presented new ways of efficiently running a Calibration Lab. After the meeting, a tour of the Lockheed Metrology Lab was offered to anyone that wanted to see it. Many thanks to NCSLI, our presenters, all that attended, and Jay Sellers and Joe Patchett for hosting the meeting and providing the tour.

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Esmeralda Adame  
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The NCSL International Rio Grande Section met in McAllen Texas at South Texas College on December 2, 2015. The Technology Campus had the honor of hosting this event and the day’s agenda was filled with an interesting schedule, great presenters and attendees. Our day kicked off with a welcome from Esmeralda Adame, NCSLI-RGV Section Coordinator and Assistant Professor for South Texas College. She was followed by Mario Reyna, Dean of Business and Technology for the college who provided some opening remarks. Both welcomed the crowd and thanked everyone for their attendance.

Esmeralda Adame then led the attendee introductions. Next an update of the NCSLI Central Division, Board of Directors Meeting and 2016 Agenda and Organization Update was provided by National Instruments. The day’s events continued with our first presentation. It was titled “Force Calibration Measurement Errors” and was presented by Phil Smith, Vice President of Business and Development at Morehouse Instrument Company, Inc. Interesting questions were brought forth at the end of his presentation. “Standards in Everyday Life” was the next presentation given by Nicolas Joy, Accreditation Officer at American Association for Laboratory Accreditation, A2LA. Students present had some interesting questions for Nicolas. Roberto Benitez, General Director at Etalons provided our third presentation titled “Pyrometry AMS2750E New Approach.”

We had about 75 present during this meeting. The attendees included our presenters, local and international community leaders, local manufacturing company managers and students. All were attentive and engaged during presentations.

Logan Kunitz, Engineer at National Instruments gave our fourth and last presentation. It was called “Exploring the Relationship between Ambient Temperature and Internal Device Temperature during Calibration.” His presentation was followed by an open discussion and closing remarks were led by Esmeralda. Short tours were scheduled at the end of the day’s agenda for the Precision Manufacturing Technology labs including Computer Numerical Controls, CNC and demonstrations. A tour and demonstration of the newly certified FESTO lab at the Technology Campus was also part of this exciting day.

At the end of the day visitors, some presenters and manufacturers explained the need for metrology experts, students and trainings.

Thank you to all of those that made this day possible and special thanks to our presenters for their noteworthy topics.
On May 12, the NCSL International NYC Section Meeting was held at the Sartorius facility in Bohemia, NY, and the scheduled presentations drew attendees from around the region. Jennifer Camarda, NCSLI NYC Section Coordinator and Sales Specialist-Weighing at Sartorius worked with Marcus McNeely, NCSLI Northeastern Division VP to coordinate the meeting and its proceedings. Jennifer was also re-appointed as NYC Section Coordinator for 2016.

We learned from some attendees that they would like to see a more hands-on learning style for the next meeting. The meeting featured four in-depth presentations and then ended with a tour of the Sartorius facility.

The first speaker of the meeting was Dawn Cross, Physical Scientist at NIST, who presented on “Transitioning from Mercury Thermometers to Alternative Thermometers.” The presentation focused on the phase-out efforts for mercury thermometers and identified alternative thermometers for a broad range of measurement applications. She also spoke to how a wide variety of regulations and test methods in several industries (such as petroleum, concrete, and pharmaceuticals) continue to utilize mercury in-glass thermometers despite the charge to find alternative thermometers.

The following speaker was Melissa Winters, Manager of Marketing-North America at Sartorius, and she conducted a training course called the “Pipetting Academy™.” Melissa focused on the proper pipetting techniques for various laboratory applications. She then explained how to avoid ergonomic risks in order to work more efficiently and safely for the most accurate pipetting results.

Jun Bautista, Sr. Director of Laboratory Operations at Masy BioServices, was the meeting’s third speaker and he presented on the “New Concept in the Calibration of Climatic Chambers (Specifically Humidity Chambers).” The presentation focused on the design concepts of climatic (humidity) chambers, calibration methods, measurement uncertainties and certification of humidity chambers. Jun concluded his talk by discussing new concepts in climatic chamber design and manufacturing that support the measurement uncertainty elements in climatic chamber calibrations.

The final meeting speaker was Jennifer Camarda, Sales Specialist-Weighing at Sartorius, who presented on “How to Avoid Influencing Factors in the Weighing Process.” Jennifer focused on identifying various influencing factors that can cause weighing errors. She also spoke in detail regarding the best operating practices to minimize these factors to promote accurate weighing.

The meeting was a productive and lively section meeting filled to the brim with fascinating ideas and presentations. We would like to thank Sartorius Corporation, for hosting our meeting and for giving the attendees such a pleasant and immersive tour afterward.

We would also like to thank the attendees for taking the time to join. We look forward to having another great, as well as hands-on, section meeting in the fall.
On April 13-14, 2016, the Philadelphia section combined meeting/training event was hosted by Cory Peters, Exelon PowerLabs in Coatesville, PA. Prior to our first speaker, Marcus McNeely, NCSLI Northeastern Division VP addressed membership opportunities and NCSLI update information. The meeting included three expert speakers: Henry Zumbrun, Morehouse Instrument Company, Dr. Cesar “Jun” Bautista, Masy BioServices, and Dawn Cross, National Institute for Standards and Technology (NIST).

Henry is the President of Morehouse, with 17 years’ experience with force calibration, and was the first speaker of the meeting. His presentation, “Measurement Traceability and Errors Related to Force Measurement,” provided the attendees information on common force measurement errors, how to identify these errors, and the importance of calibrating the instrument in the manner it is being used.

Dr. Cesar “Jun” Bautista was our second meeting speaker with his presentation on “New Concept in the Calibration of Climatic Chambers (Specifically Humidity Chambers). Jun has over 35 years of combined experienced in Metrology, 16 years of which are Biotech, Bio-Pharmaceutical and Biomedical Device related. He is currently the senior Director of Laboratory Operations for Masy BioServices, one of the East Coast’s premier metrology services provider. Jun’s presentation highlighted measurement uncertainties that may, necessarily, be considered when calibrating climatic chambers. He also demonstrated the concept of 0% RH as a reference (not a measurement) point and the rationale behind its usage.

Dawn Cross was the final meeting speaker with a presentation on “Transitioning from Mercury Thermometers to Alternative Thermometers”. Dawn has worked at NIST in the Thermometry Group since 1994. She is responsible for the Industrial Thermometer Calibration Laboratory (ITCL) calibration of industrial platinum resistance thermometers, thermocouples, thermistors, and liquid-in-glass thermometers over the range of -196 °C to 550 °C. As part of her responsibility for the ITCL, Dawn maintains the NIST quality system documentation and measurement assurance to maintain compliance with the NIST QMs and ISO/IEC 17025. She started being a NVLAP assessor in 2005 for NIST and 2008 for outside laboratories.
Dawn’s presentation addressed the ways that NIST has actively participated in several national and international phase-out efforts to identify alternative thermometers for a broad range of measurement applications. She outlined how the use of mercury thermometers has been virtually eliminated in routine hospital use, but a wide variety of regulations and test methods in the petroleum, concrete, and pharmaceuticals, to name a few, continue to specify mercury-in-glass thermometers. Dawn explained that NIST will continue to support stakeholders by providing technical and scientific support to find suitable alternative thermometers that meet their measurement needs. The presentation also examined how several U.S. government, state agencies, and international organizations are driving the removal of mercury thermometers as a means to reduce mercury in the environment.

The Trainer Event held on the second day went so well; we asked the attendees for training suggestions for the next meeting. And to our pleasant surprise, we gained a new NCSLI member by the end of the meeting!

Instructors for the training event included Kirk Marshall, Kayla Marriner, and Scott Davidson from Exelon PowerLabs along with Jun Bautista. Kirk taught two classes during the event, one in the laboratory on the topic of “Use and Calibration of Field Dead Weight Testers with Actual Cross Float Data” and the second he co-taught with Kayla covering the topic of “Rotameter Basics: Use and Calibration of Rotameters using Mass Flow Standards and NIST RefProp”.

Scott taught a “hands-on” class covering “Several methods for Building a Triple Point; including Mini Cells, Liquid Nitrogen Dip and Dry Ice.” Dr. Cesar “Jun” Bautista training class tackled the topic “Setting the Humidity Chamber to an Adiabatic Condition and Use of Isentropic Efficiency to Achieve Lowest RH% Attainable” and demonstrated the concept of 0% RH as a reference.

All attendees enjoyed the facility tour of Exelon PowerLabs and were amazed of the breadth and depth of Exelon’s capabilities. The information provided through the “hands-on” training, networking questions, and presentations will surely be used in respective laboratories going forward.
We even had the time to enjoy some “NCSLI Grooving at Lunch” with David Schurr, Exelon PowerLabs, Josh Gwinn, Measurement Instruments, and Marcus McNeely, NCSLI VP Northeast Division. The trio proved to be some incredible musicians as David made the banjo sing, Josh made the mandolin look easy, and Marcus rocked out on the guitar! Everyone agreed they would look forward to a scheduled Philadelphia section “annual training” with NCSLI.

We would like to thank our host as well as all the presenters and trainers. We would also like to thank everyone who assisted with the planning, preparation, and participation to make this meeting such a major success. This meeting provided an opportunity to learn and network with over 40 industry professionals in attendance.

I hope to see you all at the Fall Section Meeting October 20, 2016!
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Twin Cities

The NCSL International Twin Cities Section 1311 met at Boston Scientific in Maple Grove Minnesota. Boston Scientific also sponsored the event and their representative, Cory Otto, made an exceptional host! The full day event had 102 attendees and 4 speakers.

This was my second meeting as the new NCSLI Twin Cities Section Coordinator. The second meeting definitely was easier than the first and, thankfully, the butterflies were held at bay. We also have one new member to our Steering Committee, Mitch Johnson with Greatbatch, Inc. There are now 14 members on our steering committee and without all of their help the events held in Section 1311 would not be what they are today.

The first presentation was by our host, Cory Otto, who is the Manager of the Metrology Department at Boston Scientific in Maple Grove. Cory presented “Lessons Learned from 7 Years of Multisite Collaboration.” Cory detailed how he and his team have found ways to break down artificial walls between the staff at all of the different Boston Scientific Calibration Laboratory sites in order to increase information exchange, innovation, and symmetry. I found it quite interesting that the Boston Scientific team hold regular summits at the different locations around the globe from Ireland to Costa Rica. Another piece to Cory’s approach to team building is including giving back to the community, he and his team recently participated in a feeding the hungry event where his team packed meals for those in need.

The second presenter was Walter Nowocin from Medtronic. Walter’s topic was: “Review of FDA Warning Letters Related to Calibration.” Walter went on to present this same presentation at the Measurement Science Conference in Anaheim, California. I found the topic quite informative as Walter covered several of the actual FDA findings in detail. Walter performed searches in the online FDA database relating to calibration, the website he searched are publicly available and can be accessed for your reference. The sites are: www.fda.gov/foi/warning.htm and www.fda.gov/AboutFDA/CentersOffices/ORA/ORAElectronicReadingRoom/default.htm

The third presentation was by Mike Imholte of Boston Scientific. His topic was “Temperature (Back to Basics)”. Mike detailed the basic components in insuring your
temperature measuring devices are in tolerance, and continue to stay in tolerance, throughout the calibration cycle life of the equipment. Those components include insuring your probe is in tolerance after return from the vendor, what to do when the data provided is only a report of value, how to check your probe is in tolerance by reviewing drift data, calculating drift values, and determining the best equipment to perform intermediate checks on temperature standards.

The fourth presentation was by Brian Downie from Precision Repair and Calibration. His topic was “How Gages Grow and Shrink in Dimension.” Brian detailed the main causes of changes in the dimension of a gage. Brian presented those causes to be thermal expansion, material build up (Gage Galling), and molecular relaxation. I found that molecular relaxation might be the least well known cause to dimension change. Brian explained that the actual materials that make up the gage and the actual manufacturing process used can cause a gage to become less dimensionally stable over time.

We concluded the meeting by giving out the remainder of the door prizes that were left over. I would like to thank all of the companies and individuals who donated door prizes! I’d also like to give a special thanks to Cory Otto and Boston Scientific for hosting this series of incredible presentations and speakers. What a great meeting!

Special Tribute

Mike Czech recently retired from Saint Jude Medical after 27 years. Mike spent over 42 years in the Metrology Field. He has always been committed to the Metrology Community not only in the Minneapolis/Saint Paul area but globally. The Twin Cities Section of NCSL International would like to recognize Mike for his contributions to our industry.
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