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NCSLI WORLDWIDE NEWS

Laboratories and Calibration Providers

Let's Talk!

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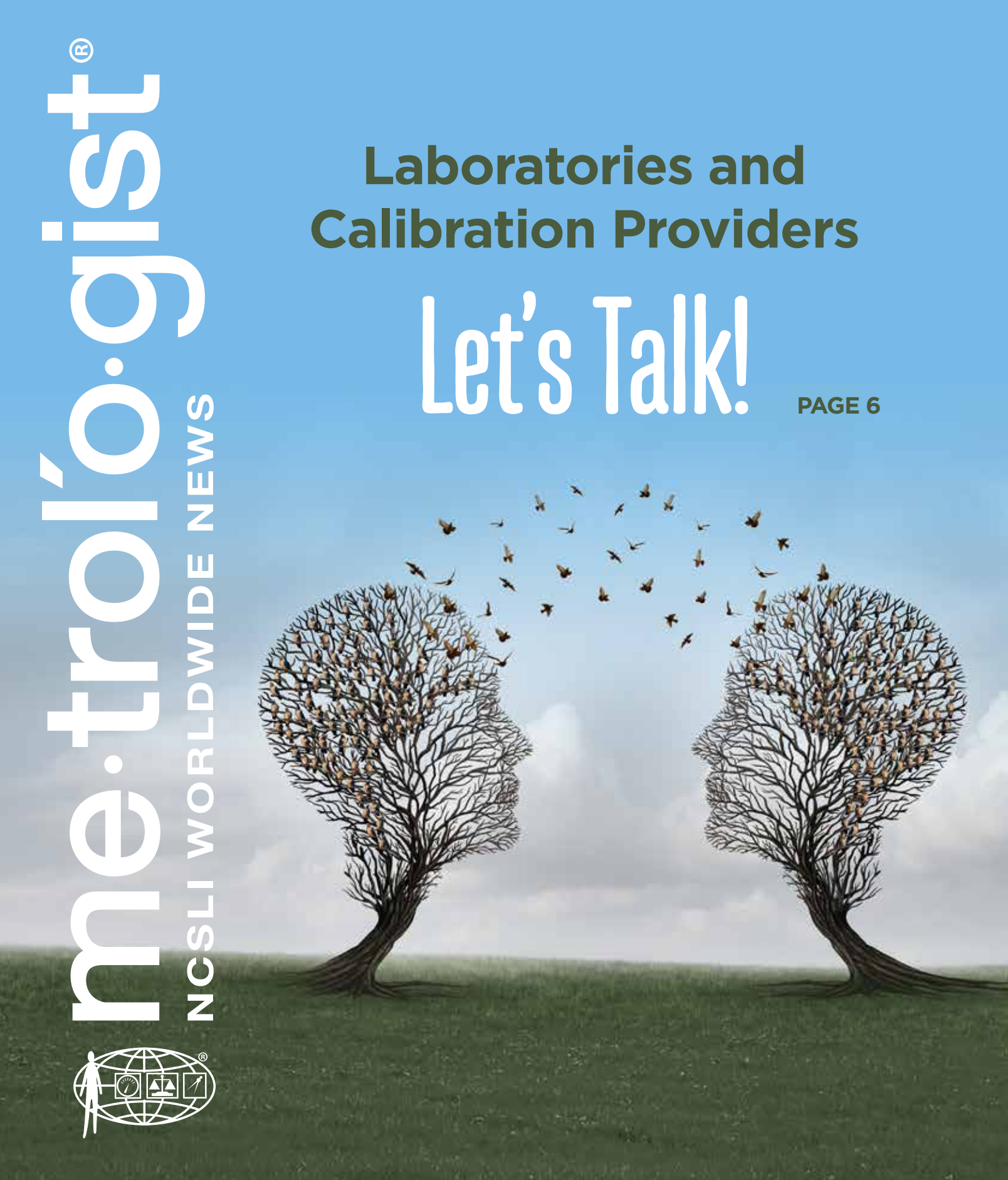

NETWORKING / PEOPLE / COMMITTEES / LABORATORIES / REGIONAL EVENTS

JANUARY 2017

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NCSLI WORLDWIDE NEWS

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SPECIAL FEATURES

DEPARTMENTS

Roger Burton
NCSLI President
rburto@sandia.gov

Greetings! Does the prospect of beginning a new year bring a sense of excitement and exhilaration for you? If you are like me, the answer is yes. The new year promises to be a time of change and will provide opportunities for us to make NCSL International an even better organization. At the Board level, we are reviewing our structure and governance model with an eye towards utilizing the Board more effectively and efficiently.

Please join me in welcoming, and supporting, Jim Olthoff as the incoming NCSLI President. I have enjoyed working closely with Jim during the last year and I look forward to the leadership and direction that he will provide NCSLI.

As you may recall, our vision is "Be the world's recognized source for measurement science expertise and information." Our success in achieving NCSLI's vision is only possible because of the volunteers and members who work tirelessly to support our projects and initiatives. My sincere thanks and appreciation to all of you!

The 2017 Technical Exchange is just around the corner, and will take place January 23-24, 2017 at the Florida Hotel and Conference Center in Orlando, FL. The measurement training program covers a wide variety of topics including: humidity calibration, microwave measurement, achieving accreditation, good weighing practices, process mapping, risk based thinking, and more. The training program, schedule, and registration information are available at ncsli.org.

You can also begin now to make your plans to attend the 2017 Workshop & Symposium which will take place at the Gaylord National Convention Center in National Harbor, MD on August 13–17, 2017. The theme of this year's conference is "Precision and Performance with Measurement Science." Based on this theme, the conference tutorial and technical program will focus on topics surrounding the update of *ISO/IEC 17205*, the effect the update will have on evaluations of competence and accreditation in various fields, and other related issues.

As I reflect on completing my term as President, I think about how much of an honor and privilege it has been to serve in this capacity. Working with the Board, the business office, the members, volunteers and our partner organizations has been an incredible opportunity. By acting as President, I have been able to foster support for the metrology community by networking with metrology professionals, businesses, and NMIs from around the world. I am grateful to have had the chance to promote metrology's importance to society with the help of so many great individuals from across many industries. I have learned so much from this experience and I believe NCSLI is in a good position for continued success. I hope to see you at the annual Conference in August!

Welcome New Members

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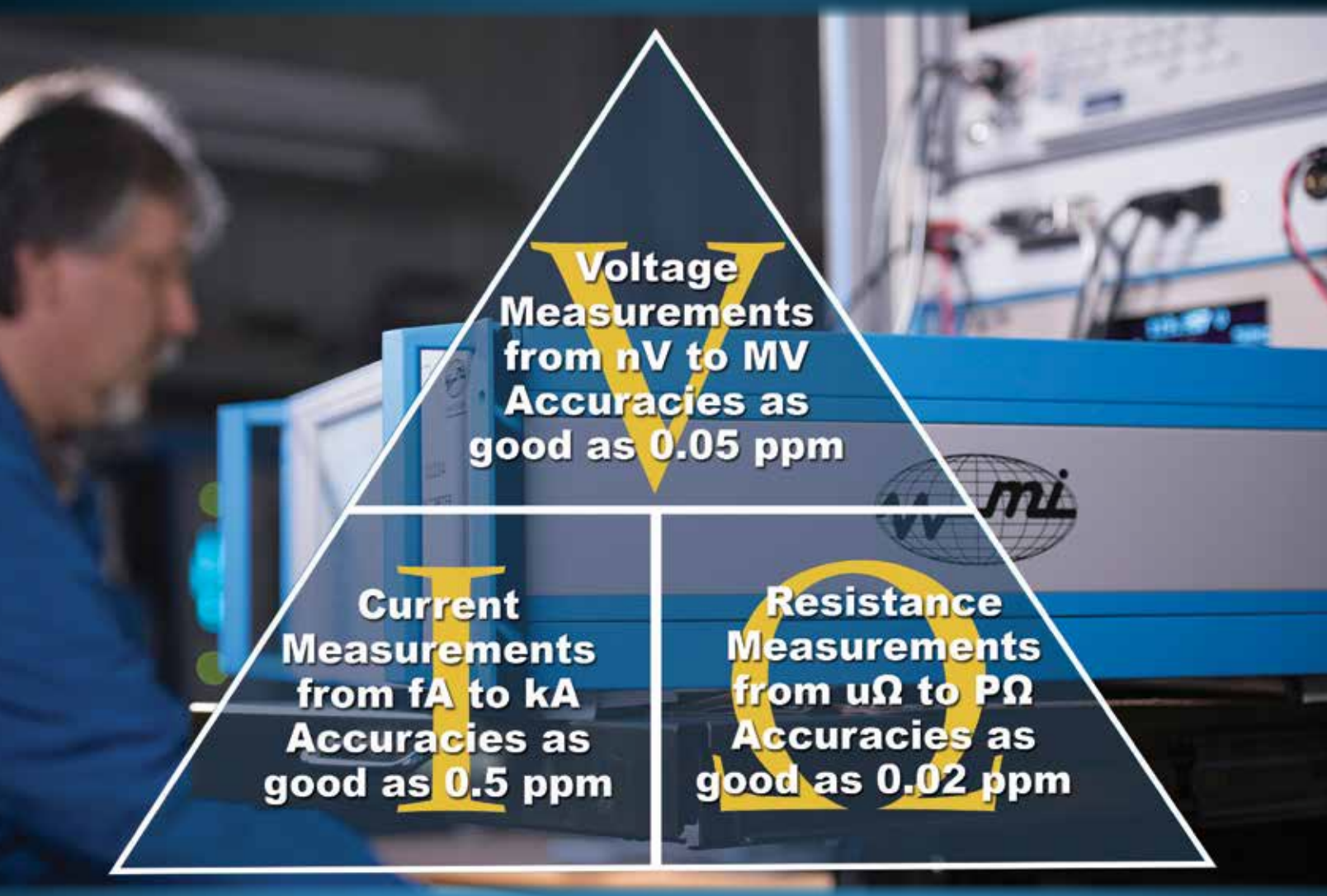

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Laboratories and Calibration Providers: Let's Talk!

Rob Knake
A2LA Accreditation Manager, Calibration
rknake@A2LA.org

The American Association for Laboratory Accreditation (A2LA), accredits a large variety of laboratories and other organizations such as reference material producers, proficiency testing providers, inspection bodies, and product certification bodies. A2LA is the largest accreditor of calibration laboratories in the United States with over 700 organizations accredited. These calibration laboratories support many of our other accredited organizations as well as other accredited calibration laboratories. Over my 10 years with A2LA I have had the opportunity to manage a number of accreditation programs in the testing and calibration areas. Regardless of the area of accreditation, it appears that communication between accredited organizations and calibration providers can be improved.

First, let me describe what happens when there is a lack of communication on and responsibility (by all parties) for the calibration service provided:

A laboratory ships an instrument to their calibration vendor with a purchase order that only states: "calibrate per *ISO/IEC 17025*." The owner of the equipment assumes the calibration vendor knows what calibration is needed from the small amount of detail provided, since they are the calibration expert after all.

The calibration vendor receives the order and contacts the laboratory who owns the equipment to obtain specific information on the service needed. The shipping clerk at the laboratory answers the call from the calibration vendor, doesn't really know how to answer their questions and tells the calibration vendor to "just do what's best." The calibration vendor, being in a hurry to complete the calibration because it is a rush order, defaults to their "standard" level of service.

The laboratory receives the calibrated instrument back from their vendor, performs a cursory check to ensure that the instrument turns on and that the paperwork was included in the box and places the instrument back into the laboratory for use.

Later, when a third-party assessor comes onsite for the assessment of the laboratory, the laboratory receives two deficiencies regarding traceability because (1) only a limited calibration was done (where only a portion of the specification was evaluated) on the instrument and (2) the calibration certificate was not endorsed with the accrediting body's (AB's) symbol and the laboratory's accreditation certificate number. The quality manager for the laboratory, when filling out the "root cause" information in the corrective action form, writes "the calibration vendor provided the wrong service from what was needed."

What went wrong here?

A simple answer is that there appears to be a communication problem between the laboratory and the calibration vendor. Let's take a moment to address some potential issues that cause these breakdowns in communication.

1. We aren't speaking the same language:

One of the most important factors in effective communication is ensuring that we are speaking the same language and that everyone can understand one another. However, the calibration vendor is generally going to be a metrologist (i.e., a measurement scientist) and they are going to speak the language of metrology. Laboratories reaching out to a calibration vendor might not speak this language as they rely on the calibration vendor to speak and understand it. This leads to an immediate problem as the laboratory and the calibration vendor can't communicate effectively from the point of initial contact. This isn't just the laboratory's fault; the calibration vendor has to recognize that language is an issue and they have to be able to interpret their metrology speak into a common language that can be understood by their customer. Communication is a two-way street and both parties must ensure that they understand each other.

Think of when you take your car to the mechanic for routine maintenance. The mechanic speaks a different language than most of the customers that walk through their door. The mechanic might start rattling off technical terms and car parts and you have no idea how to translate it into your language. You just went to the mechanic to fix your car so you can keep driving. The mechanic should have an understanding of how your car is performing and how you use your car so they can perform the appropriate maintenance and repairs. Poor communication on either side of the conversation can cause the wrong or unnecessary services to be performed on the car. I don't know how many times I had the blinker fluid changed in my car before I realized that wasn't even a thing!

It's critical that the laboratory and the calibration vendor take the time to ensure they are speaking the same language and that the appropriate information is conveyed before proceeding with the calibration service.

2. It's all about perspective:

It is also important that the laboratory and the calibration vendor understand that they have quite different perspectives when they approach the interaction for requesting calibration service. The way a laboratory looks at a balance is probably a lot different from the way in which a calibration vendor looks at a balance. They both see it is a device that is capable of measuring mass, but the laboratory uses that balance as a tool to perform their work and the calibration vendor views that balance as the item under test and the balance is their work.

The laboratory knows exactly how that balance is used in their laboratory and the calibration vendor must assume that it is used as a typical balance would be used in any variety of laboratories. Also, the laboratory may not be very familiar with how that balance operates and the balance may not be a very critical part of their measurement process. However, the calibration vendor is the expert; they understand very well how that balance

operates and the scientific principles behind the associated measurements. To them, the balance is a critical part in their measurement process. And don't forget the fact that, to the laboratory, calibration service is an expense and to the calibration provider it is a source of revenue.

It's important to remember the different perspectives when communicating to ensure that each party understands one another and appreciates the unique perspectives.

We've talked about some potential reasons for communication breakdowns that lead to problems when requesting calibration service. However, it is important to remember that there is a lot of common ground that most laboratories and calibration vendors have; that is, the requirements of *ISO/IEC 17025* and accreditation body requirements. The *ISO/IEC 17025* standard has requirements for Contract Review (Section 4.4), Subcontracting (4.5), Purchasing (4.6) and Reporting the Results (5.10) that all address the interactions between laboratories and their calibration vendors. What all those requirements really boil down to is ensuring appropriate communication between the laboratory and calibration vendor to ensure the laboratory ordered what was needed and the calibration vendor provided what was requested.

It is also important to remember that the laboratory and the calibration provider are really in the same business of providing reliable data to their customer. Both parties want to ensure that their customer is receiving the best and most reliable data and to do that, all parties must ensure that they understand the needs of their customer. Things can be improved with better understanding and better communication throughout the calibration service process.

When both parties understand the requirements for purchasing and receiving calibration services, properly communicate their needs, and take more responsibility for the service provided, many of the misunderstandings that occur during this process can be avoided.

Credit: A2LA Insider

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From the Archives

A.J. Woodington Measuring Excellence and the Importance of Metrology

A.J. Woodington.

NCSL International has seen its fair share of Executive Chairmen and Presidents over the past several decades, but for this edition of *Metrologist* we would like to focus on one of the earliest Chairmen, A.J. Woodington; a name that many of us in the measurement science and metrology community know as synonymous with dedication, success, and professionalism. After serving in World War II, A.J. established his career in metrology by receiving his Bachelors of Science in Electrical Engineering in 1949 from Purdue University. In 1952, after once again serving his country in the Korean War, he became the Chief of Measurement Control at General Dynamics/Convair Aerospace. He held this position for the entirety of his 19 year career and along the way helped to influence a plethora of measurement science and metrology boards, including NCSL International; which was, at the time, solely NCSL. The foundation of Woodington's entire career was the promotion and publicity of metrology, in any medium, in order to create a better awareness and understanding of the importance of calibration, measurement standards, and measurement services.

NCSL had the honor of appointing Woodington as Chairman of the Board from 1963–1965. For those two consecutive years our organization experienced immense growth that would become the foundation for what NCSL International is today. As Chairman, Woodington guided NCSL through several successful conferences, workshops, and events, each strengthening the importance and appeal of NCSL in the eyes of working metrologists and measurement science professionals. Also during his time as Chairman, Woodington guided the Organizational Committee in updating the NCSL bylaws and, in doing so,

1963

effectively led to creation of the first official NCSL Board of Directors. Even after stepping down as Chairmen, A.J. continued to serve NCSL and the metrological community by acting as the Program Chair in 1973. In 1971, NCSL awarded Woodington with the "Outstanding Service" Award for having served in various NCSL positions "with sustained distinction since NCSL's inception."

Outside of NCSL International, Woodington spread his influence throughout the metrological community by acting as member of several other metrological societies. As a member of the ISA Metrology Division (METROD), he served as a frequent panelist and session developer for several Annual ISA Conferences throughout the 1960s. In 1965, Woodington joined the METROD Committee on Ethical Practices and in '69 he was appointed Secretary-Treasurer of METROD. Soon after in the early 70s, A.J. became the METROD Associate Director of Administrative Offices and a member of the Publications Committee. For the San Diego City Colleges, Woodington oversaw the development of numerous metrology courses as a part of their Advisory Council for the Quality and Reliability Program. As Chairman of the Joint Measurement Conference Steering Committee in 1973, he successful curated a conference sponsored by five national measurement service societies at the National Bureau of Standards located here in Boulder, CO. He would then go on to become Chairman the following year for the Joint Measurement Conference at NBS in Gaithersburg, MD as a representative of ISA. All this to say, wherever there was a measurement science or metrology society, there was a strong chance that A.J. was supporting it with hard work, passion, and vigor.

1963

His dedication to the study of measurement and its

1963

promotion truly knew no bounds, and it showed in each of his presentations, speeches, and essays. Besides his various presentations and lectures for ISA, NCSLI, and NBS, Woodington wrote several essays on vital conversations and issues within measurement science. Mainly he spoke to the necessity for the U.S. to convert to the metric system through his essays "International Metric System," "The Transition to the Metric System of Measurement," and "What and Where." Through each essay he expressed the history, quality, and importance of an international system of measurement and presented cost effective methods of national conversion since the U.S. Congress was primarily concerned with costs and economics.

1963

To the measurement science world's surprise, Woodington's illustrious career was cut short when he was killed in 1978. That year the Measurement Science Conference (MSC) created the Woodington Award in his honor. This award has been given out every year since 1978 to individuals within metrology and measurement science that exude the same dedication, professionalism, and passion that A.J. did throughout his 19 year career. As MSC states on their website, "Andy was a person who clearly personified the expression 'Metrology Professional'." It is this type of unwavering support for measurement standards and studies that we strive to see within our NCSLI members and volunteers every year. Measurement is a pivotal part of human existence and it is because of people like A.J. Woodington that we, as a community of professionals, have the means and ground to promote its necessity and understanding.

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In Memory

Remembering Our Friends and Colleagues

Anthony Anderson

DECEMBER 13, 1944 – OCTOBER 6, 2016

Tony Anderson passed away on October 6, 2016. Tony was active in NCSL International for over three decades, serving as President in 1996 and winning the Wildhack Award in 2004.

Tony was a long-time member of NCSL International. He served four years as the Membership Chair and in 1987 and 1988 took on the Director of Regions. In 1989 he was appointed Vice President of Operations and Marketing, and elected the following year to continue in that role. In 1993, he became Conference Vice President, and in 1995 he was elected Executive Vice President, moving into the Presidency position in 1996.

While serving as President, Tony created the International Vice President position on the NCSLI Board. This was the only appointed position and Tony appointed Ed Nemeroff as the first International Vice President. This move was a major motivator towards changing the organization's name from NCSL to NCSL International. In 1997 he was re-elected to the board as Vice President of Standards Policy and continued to be active on several committees in the organization. Tony was active in representing NCSLI in the National Cooperation for Laboratory Accreditation (NACLA) and served as the NACLA member delegate for NCSLI, treasurer, and a member of the NACLA Board of Directors. In 1997 the International Cooperation for Laboratory Accreditation (ILAC) invited NCSLI to become a member of its Laboratory Committee. Tony became the first Representative to this committee, and obtained for

David Braudaway, Ed Nemeroff, Tony Anderson, Graham Cameron, Mike Suraci, Klaus Yeager.

NCSLI the position of stakeholder membership in ILAC. In 2002, at the Berlin General Assembly of ILAC, he was elected Chairman of the Laboratory Committee and to support this new role, NCSLI appointed Tony to the position of Director to ILAC/NACLA and a permanent member of the Board. Tony also served for many years as site selection chair for the annual Workshop & Symposium. The highlight of Tony's association with NCSLl came in 2004 when he won the prestigious Wildhack Award, given for outstanding service to the metrology community. Like so many other volunteers, Tony loved the organization and devoted his time and talent wherever it was needed.

Tony completed a 5-year student apprenticeship in Electrical and Mechanical Engineering with the British Ministry of Aviation before graduating from the Royal Aircraft Establishment (RAE) College in Farnborough, England. He worked several years as a Development Engineer for a CCTV company and joined Solartron (Schlumberger) in 1970 as a sales engineer. Tony held various positions within that company and traveled extensively in Europe and North America. He moved to Guildline Instruments Inc., New York, in 1979. In 1982 Tony was appointed Vice President of Planning and Technology and relocated to Smiths Falls, Canada. In 1985, Tony moved to Orlando, Florida when the U.S. sales office for Guildline was moved there from New York.

Tony was a proud "Yorkshire man" and long-time supporter of the local soccer team, Sheffield United — The Blades.

Tony was married for 47 years to his wife Pauline. In addition to his wife, Tony leaves behind his sons Stuart (wife Laura) and Ian, and his grandson Colin.

Tony was born in Sheffield in the county of Yorkshire in the north of England and was always proud of being a "Yorkshire man." Since he was a child, like his father and grandfather before him, he supported Sheffield United, the local soccer team. The nickname of this team is "The Blades" as Sheffield has always been known as a steel town and is still famous for its knives. Even though The Blades were back in England, Tony followed them closely via satellite.

For over 20 years, Tony spent much of his spare time coaching soccer. He was a U.S. National Licensed Coach, and was a member of the Founders' Club, World Cup '94, which organized bringing the World Cup Soccer Championships to the United States in 1994 and to Orlando, which was one of the nine host U.S. cities. Tony coached two excellent teams and took both teams to Europe to play against teams over there. They spent time in England and even played against the "Junior Blades" in Sheffield and beat them!

His other pastimes included golf, model railroading, and woodworking. Tony enjoyed his Thursday night golf matches, and frequently made a clutch putt to put his team "in the money." He also had a room in his house devoted to model railroading. One of his favorite pastimes was teaching grandson Colin about trains, and letting him "run" a train around the track. Tony also enjoyed woodworking, and even built several pieces for NCSLI.

Tony was known for his endless energy, his generosity, and his sense of humor. He touched many lives in the metrology community throughout his career and his legacy lives on through the continued success of NCSLI.

Tony Anderson with "The Capital Steps."

Tony, Pauline and friends.

Front row: Graham Cameron, David Braudaway, Ed Nemeroff, Klaus Jaeger
Back row: Ernest Garner, Dick Pettit, Tony Anderson, Howard Castrup, Mike Suraci.

STEPPING BACK TO 2011

NCSLI PAST PRESIDENTS

Over the past 50 years, our past Presidents have made many important contributions to the vision, mission and success of NCSLI. The conference attendees recognized the past Presidents with a standing ovation recognizing their leadership and contributions. Past Presidents — Jerry Hayes, Mike Suraci, Ed Nemeroff, Tony Anderson and Malcolm Smith, each representing the decade in which they served, shared their insights, memories and stories.

Risk Management for Performance Improvement in the Calibration and Testing Laboratory

Chet Franklin
Franklin Consulting
and Training Systems
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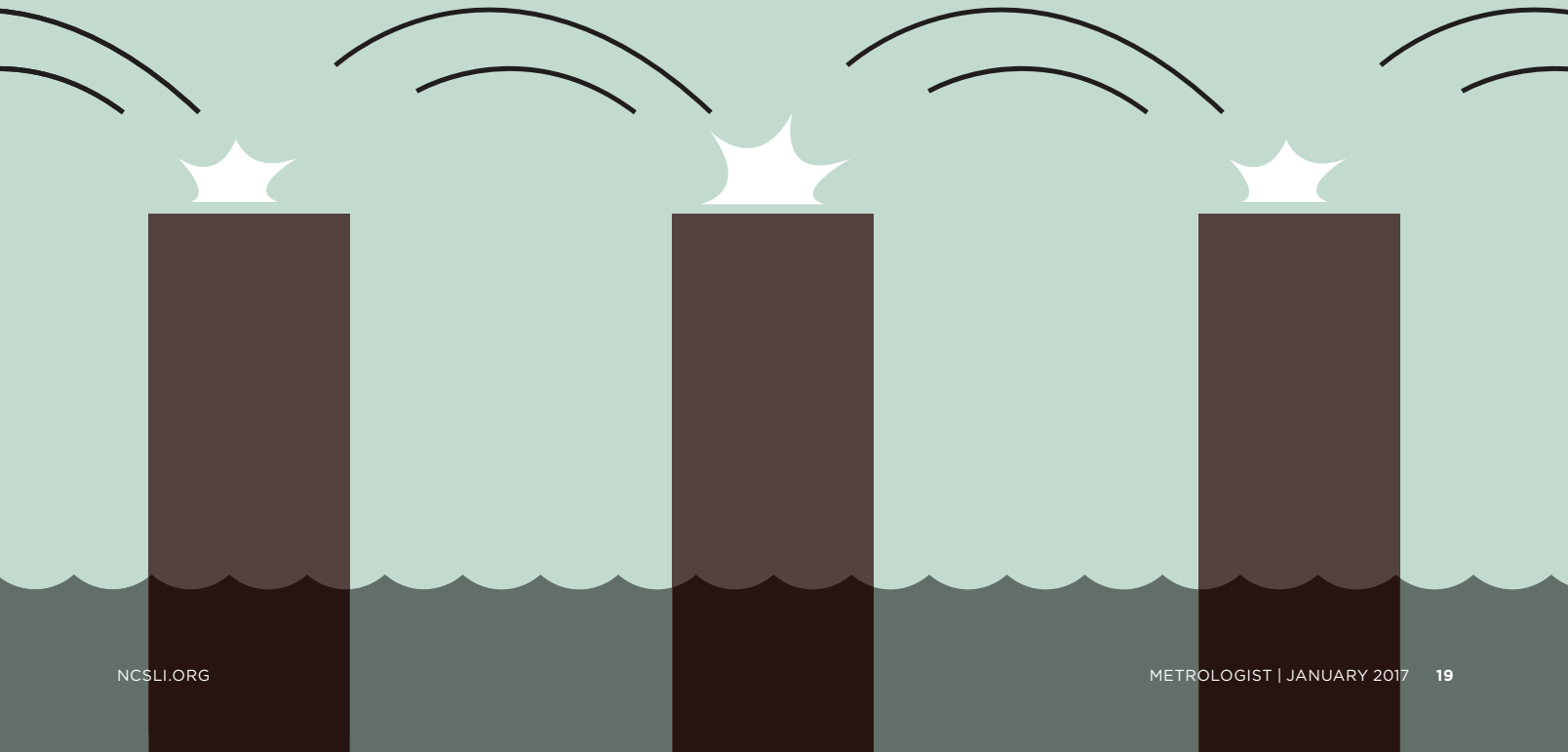
Why is risk management an essential part of operations management for any business — including, or maybe even especially for, the calibration and testing laboratory? What is risk management? Isn't it a financial management plan for investors and insurance brokers?

So, what is a risk? Merriam-Webster defines risk as: "the possibility that something bad or unpleasant will happen." There are writers out there who like to talk about negative risks and positive risks. I don't know about you, but I fail to grasp the idea of a positive risk! Supposing your Chief of Operations rushes into your office excitedly proclaiming: "We are at risk of being ahead of schedule!" or maybe your CFO announcing that: "We're at risk of making a larger profit than planned!" Positive risks? Explain that one!

This article explores the use of Failure Mode and Effects Analysis (FMEA) by a laboratory for predicting operations risks and analyzing the effects of those risks. Risk management includes reducing or even preventing the effects which might cause major disruptions in business operations and customer satisfaction. FMEA could be a tool as essential to the laboratory as an Oscilloscope or a Spectrum Analyzer. FMEA has been proven to be a valuable tool for use in process/performance improvement and assuring that customer requirements are being met as best as possible. FMEA can be an essential tool for assuring continuity of operations.



Here are eight reasons why risk management should be considered as a necessity for assuring:

1. Continuity of Operations (COOP) – reduced down-time
2. Customer Satisfaction – repeat customers
3. Employee Satisfaction – longer term employment
4. Employee Safety – reduced insurance
5. Equipment (asset) management – reduced maintenance costs
6. Performance Improvement – cost savings, reduction in rework costs
7. For enhancing the "bottom line" – improving profit
8. Staying in business

In order to assure these eight goals, every business should have a RAMP. Wait; I'm not talking about the kind of ramp that a business would have in place at the entrances of their building in order to satisfy the Americans with Disabilities Act (ADA). Not that kind of RAMP! The RAMP that I am referring to is a Risk Assessment and Management Plan. This is a management plan that addresses the question, what could happen that would have a serious and detrimental, possibly even disastrous, effect on laboratory operations? If a disaster occurred, what actions could we take? What would it cost us? Could the negative event have been foreseen and the damage minimized, or even prevented?

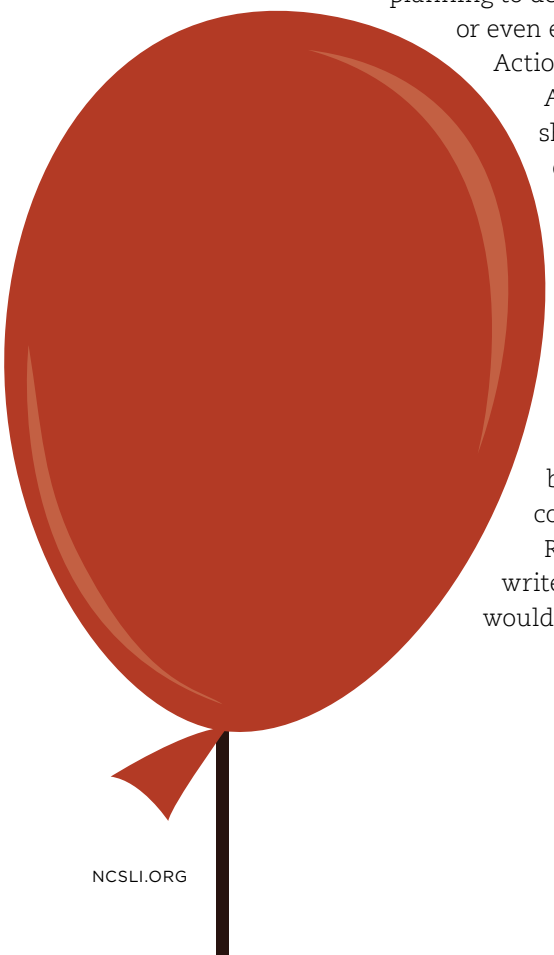
How could you go about devising such a RAMP? Is there some kind of standard process or blueprint? If there is can you download it and adapt it to your laboratory? It is not necessary to start from the ground floor; there exists a standardized process, which can serve as the foundation for your RAMP, and yes, you can adapt it to your laboratory. Several actions can be taken. That standardized process is called Failure Mode and Effects Analysis, or FMEA.

You have heard of FMEA; right? In fact, you've probably heard a lot about it; it's been around for a long time. One of the arguments against FMEA is that no one can predict the future. The reality is that anytime we prepare a plan of action, let's say install a new piece of equipment, we are in a sense predicting the future, as best as we can. We plan to have that equipment in place in the laboratory in six months from the day we make the plan. So, we are predicting that we will accomplish that task on that date! We mark it on our Gantt chart with a milestone symbol. We are confident enough in our prediction that we start preparing the location for it. We're predicting the future, right? What will we have in place on the day it arrives?

You've heard comments such as; it's just a project management tool; it's probably good for process management; it's a lot of work. You have heard right: it is a project management tool; it is a process management tool; and when misused, as I have seen many times, it can be a lot of work; besides costing a lot of money. Maybe you have used FMEA for projects or processes sometime in the past. It is not usually seen as an operations management tool. But, doesn't operations management usually involve the

managing of a group of processes? Aren't there some occasional projects for the Laboratory Operations Manager to handle? I have been a Project Manager, a Program Manager and an Operations Manager, and in any of those roles I have considered FMEA to be a power tool. Is it a new tool that someone just thought up recently, along with the internet? No! FMEA was started in the 1940's by the U.S. Military. It was then adopted by the aerospace and automotive industry, by the airline industry and still later in 1974 documented as MIL-STD-1629 titled: "*Procedures for performing a failure mode, effects and criticality analysis.*" That standard applied to the design, research and development, test and evaluation of all items of equipment. True, that standard has since been cancelled, but the concepts were not. Being cancelled had nothing to do with content. In 1994, Secretary of Defense William Perry issued a memorandum, now known as the "Perry memo," that prohibited the use of most defense standards without a waiver. In their place, the DoD encouraged the use of industry standards, such as ISO, SAE, ASQ and others. The most current standard is IEC 60812: *Analysis techniques for system reliability – Procedure for Failure Mode and Effects Analysis (FMEA)*.

Okay, let's take a look at the FMEA as a Power Tool. It is an; "**If; Then**" management practice. **If** such-and-such happens, **then** what? It is simply a process for analyzing and managing unplanned or unexpected events. The analysis phase includes considering the Mode of the event (the possible failure), analyzing the effect of that event, then analyzing the severity of the effect, followed by evaluating the probability of occurrence and the possibility of pre and post detection of the event. The analysis is then, or should be, followed by planning to detect and reduce the probability of occurrence, and reduce or even eliminate possible effects. These plans are the: Preventive Action Plan (PAP) and the Corrective Action Plan (CAP).



A very useable form for this tool is a Microsoft Excel spread sheet. The sheet consists of several columns. I plan to discuss the full document, but I am not going to try to show all columns at once, so I'll take a section-by-section approach. Classically the first column is labeled FUNCTION; for application in a laboratory I choose to label it ITEM CONSIDERED. Why? Because you might not be considering just functions you might be considering equipment; in fact, in a laboratory environment equipment items are likely to be of primary interest. Therefore, we could be considering FUNCTION or ITEM. Tracking can be enhanced with a column to number the items being considered.

Realize that in the cells there is not likely to be room to write everything, such as Potential Failure effects. The entry would be a reference to a document which analyzes the effects.

Here is the first Section:

Laboratory Section:				
ITEM NUMBER	ITEM CONSIDERED	POTENTIAL FAILURE MODE	POTENTIAL FAILURE EFFECTS	SEVERITY
1				
Etc.				

The first part is basic. It indicates that the analysis is for the Physical/Mechanical section, the RF/Microwave, or some other section, or even the entire laboratory. Often it can be more effective to treat each section separately since they are not all sensitive to the same things, such as the measurement equipment that could be affected.

ITEM CONSIDERED: Item considered could be a process result or a piece of measuring equipment. Let's assume that you have pieces of equipment – other than the water cooler - that could be affected by some event that you want to consider. List them in the rows below. Remember, the rows may be numbered for easy reference, especially if there are several items.

POTENTIAL FAILURE MODE: Okay let's talk about this one a little. What is a Failure Mode? This is simply an event, an event that is a risk, potentially something that could happen. The word "failure" is used here to simply indicate that something might not happen as planned. Some people avoid FMEA because of the negative aspect of using the word failure. Maybe the potential event is based on the knowledge that something similar has happened in the past. For the sake of this discussion let's consider it as an event that could negatively affect the ITEM CONSIDERED. There may be more than one event affecting any one of the items considered. List them all. The Mode could be a natural event. For such a case, you can't do anything to prevent it. If your laboratory is in California the Potential Failure Mode might be earthquake – a lot of items could be affected, especially if they are kept unsecured on high shelves. You might be in an area subject to thunderstorms and the Potential Failure Mode might be an extended power outage, or major power spikes. Maybe your lab is located in an industrial park and the business next to your laboratory is a warehouse for a paint manufacturing company (flammables?). You know of some such potential events that might be likely in your area. Plan!

Take notice of "Potential." The mode is probably not something that was accounted for in the design of your laboratory, or your processes. You might decide to list a Potential Failure Mode first and then list every item in your lab that could be affected. Consider also that there could be more than one potential failure mode that could affect any item considered.

Back to the "**If; Then.**" **If** a particular event occurs, then **what**?

POTENTIAL FAILURE EFFECTS: What might be the effect of the event? What impact would the event have on operations? This is your first input for action planning. What would be the effect of the Potential Failure Mode on the Item(s) Considered? The effect might be so minor that no further consideration is needed – no action planning required. However, this is a significant step in the FMEA process. Form a team; get inputs from all parties that would be concerned, or whose work might be affected if the item being considered is damaged, or made non-operational, or the reliability rendered suspect after the event.

Rate the **SEVERITY!** If the item being considered could be Potentially affected, consider the severity of the effect (the result). Next, rate the severity of the effect on a scale of 1 to 10 – there is no zero. A rating of 1 implies that it will have a minor effect, maybe so minor that no further consideration is needed. A rating of 10 implies that it will have a very severe effect on the item or its use and some action planning is advisable. Once again, only the laboratory staff (the team), those most familiar with, or directly impacted by the item considered can make that call.

That was the first four columns. Here is the next Section:

Team Lead:				
POTENTIAL CAUSES	OCCURRENCE	CURRENT PROCESS CONTROLS	DETECTION	RPN

Team Lead: Another easy one; identify the Team Leader.

POTENTIAL CAUSES: We're still using Potential remember! Now we're looking at what could cause the Mode; what could cause the event. Of course, it could be natural causes, earthquake, storm, fire, flooding, etc., so don't waste time and money trying to prevent it. The most easily overlooked is that it might be caused by the effect of a prior event! The potential cause may be the lack of proper training. Maybe the customers' requirements were not clearly identified, maybe not stated in measurable terms. Supposing a key calibration technician, the only one you have with certain expertise, might become ill or suddenly die. Maybe the cause was a power failure; short term or extended. Maybe one of the computerized pieces of test equipment had a software glitch, or was not properly protected against viruses, or voltage spikes. Maybe

it was hacked into! As you can see, the potential cause could be identified first. Maybe you're in an area where power outages or power fluctuations are fairly common occurrences. For such a condition, you might list the Potential Cause first and then list all the items which might be affected by it. The situation may require conducting a Root Cause Analysis. Remember, it is not required that the items being considered must be listed first. The FMEA power tool is flexible. Like your power drill, where you can change the drill bit to suit the immediate need; you can modify the FMEA tool to suit the immediate need.

OCCURRENCE: What is the likelihood of occurrence of the potential cause? The intent here is not to conduct a statistical probability analysis (although it could be if you're so inclined). The most cost effective way is the best estimate of the team leader, or a consensus of the team. It will probably be based on experience.

If it's very likely, (but not certain and we'll talk about that later), to occur, then rate it as a 10. If not very likely, rate it as a 1. Use your best judgment, it will fall somewhere in between 1 and 10. Remember, no zero! A suggestion; if the likelihood of occurrence is 10, give it special attention. Perhaps here is a good place to interject a point. You will read some material on FMEA that presents the idea that the ratings actually represent percentages. In other words, a rating of 1 is translated as 10 percent. A rating of 10 represents 100 percent. Consider this: if the likelihood of occurrence is 100 percent then it's not really a risk, is it? That would be a predictable reality; a for-sure thing and would not require spending time on risk analysis, now would it? A rating of 10 means that the best guess, maybe based on past experience, is that the occurrence is highly likely. The key word here is "likely"! Don't get caught up in analysis paralysis trying to analyze the likelihood of a sure thing. A sure thing does not justify the time spent in analysis; just take care of it!

CURRENT PROCESS CONTROLS: You have a pretty good idea of the cause, you have a pretty good idea of the likelihood of occurrence; so, what process controls do you have in place, or can you put in place, to detect something before it occurs? You know your laboratories capabilities, you know your equipment, you know your team's skills, and you track and monitor a lot of things. The cause is often preceded by some sign, or signs in performance. What can you track and monitor in order to detect cause, or an event, before it occurs? My philosophy is that you can't manage what you don't measure and track. For the laboratory that should be systemic; by the very nature of their business — laboratories measure and track things.

DETECTION: Another rating; based on process controls in place. If the possibility of detection of the cause is high, that is if detection is very likely, then rate the possibility of detection as 1. A rating of 1 is always better than 10. If you have no way of knowing that the land mine is there until you step on it, then you will have to rate it as 10! Remember, no zero!

RPN: As you have noticed already, the next column is labeled RPN. What is RPN? RPN stands for Risk Priority Number. The RPN is calculated by multiplying the three ratings: Severity Rating, times Occurrence Rating, times Detection Rating: (SxOxD). If all three are rated as 1 the RPN is obviously 1; if all three are at 10 the RPN is 1,000. Now you see why there are no zeros in the ratings.

So, what do you do with this RPN? The Risk Priority Number tells us that the higher the number, the higher the priority, therefore the more attention that item needs. This leads us to action planning, doesn't it? So, what is a good or bad RPN? Some organizations set thresholds (set points, triggers) for RPNs. For example, it might be decided that within some sections of the organization any item with an RPN of 350 or more must have an action plan; items with RPNs between 350 and 100 are monitored; for items with RPNs below 100 no action is taken. For other, more sensitive sections the threshold for action planning might be 200. There are no set, or standard values as it is usually the laboratory managers' call. Remember that Preventive Action Plans are always first choice, of course.

Okay, you have completed the analysis part; time for action! Let's look at the next columns.

PLANNED ACTION	ACTION PLAN DUE DATE

Now it's time to focus on the actions. Obviously, there is not enough room on the form to write out your action plan. In PLANNED ACTION, you will probably put some notation that identifies the action plan. What is the due date for the action plan? The due date should be very specific for either the Preventive Action Plan (PAP) or the Corrective Action Plan (CAC) and usually the sooner the better. The PAP may not be possible for preventing the event (you don't know when there will be a power failure), but for mitigating or even preventing the possible effects. It can be written and a due date scheduled. Consider the due date to be for the action plan. Don't wait for the event!

For both plans this is the "**Then**" in the "**If; Then**" formula. Don't write your CAP or PAP and put them in the file to be forgotten, they may need to be accessed on short notice, or updated as changes are made in laboratory processes from time to time. For the PAP it's the Action Plan due date, not the "Action taken" date. Don't wait to write your CAP until occurrence of the event. You might not know the full range of effects but they can be estimated and then the CAP updated when and if the event occurs.

The following is an addition to what might be considered the "Normal" template, but can be very beneficial in operations planning, tracking and reporting. It has been employed by aerospace companies for several years.

This column can be added to track overall progress on the actions:

Action Tracking
Actionee, status, issues, etc.

This column would be used to track CAP or PAP activity. There might be room for the actionees name and contact, but once again the details, particularly status reports will probably be in an associated document, or two.

Another addition to assist in tracking:

Item	Actionee	Due Date	Actual Start Date	Indicate CAP or PAP Actions Taken	Ratings			RPN	
					S	O	D	Orig.	Rev
	(Team 1: Led by John (or Mary) Actiontaker)			(Report #)					

The intent here is to track actions, either the PAP or CAP, or both. The Item number is indicated along with the Actionee, Due Date and Actual Date of the action. The Actions Taken will probably refer to another document. The S, O, and D columns are of course Severity, Occurrence and Detection ratings. A PAP might cause a reduction in these ratings which can be noted as the event is tracked. The RPN column indicates the original RPN and the revised, hopefully reduced RPN.

A final note: Work with your staff, your team, in mapping out your laboratories RAMP. Do some training; create a scenario and practice working out the details. For example: supposing your laboratory had a utilities failure – no electricity, no water, and no gas - for two or more days, what would your Preventive Action Plan (to prevent or reduce severity of the effects), or a Corrective Action Plan ("Fix it after it broke"), look like? Consider the effects on your laboratory's Continuity of Operations and on your ability to serve and satisfy your customers.

Consider FMEA to be the least expensive causality insurance you can invest in! It will help the laboratory to assure:

1. Continuity of Operations (COOP)
2. Customer Satisfaction
3. Employee Satisfaction
4. Employee Safety
5. Equipment (asset) management
6. Performance Improvement
7. For enhancing the "bottom line"
8. **Staying in business**

As a contractor, Chet has been creating process management procedures for the Navy Metrology R&D Program for the past 20years. Prior experience includes being an Industrial Designer, an Engineering Manager, and a Quality Manager. He started working with ISO 9000 standards and ISO 17025 while still in their draft form. His quality experience includes being trained and mentored by Phil Crosby (Zero Defects) and trained by W. Edwards Deming (TQM). He has taught quality courses and been a speaker in the U.S., Egypt, Europe, Mexico and Canada. He is the owner of Franklin Consulting and Training Systems, and can be reached at ChetFranklin5@gmail.com.

NATIONAL METROLOGY INSTITUTES

NIST Unveils Forensic Technique to Measure Mechanical Properties of Evidence

Contact: Frank DelRio, frank.delrio@nist.gov

You may have seen it on CSI: The star examines hair from a crime scene and concludes its color or texture looks like the defendant's hair, or maybe his dog's. Case closed.

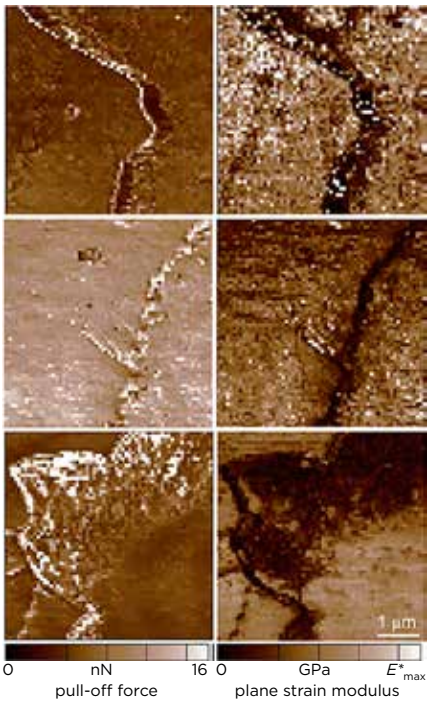
But looks can be deceiving, as well as vague and subjective. In real life, the FBI is now reviewing thousands of cases involving hair comparisons going back to the 1980s because traditional identifications—often based on looks alone—have been called into question.

Instead, what if investigators could precisely measure a hair's mechanical properties—its stiffness and stickiness? In fact, they can, according to recent experiments at the National Institute of Standards and Technology (NIST), which is developing science-based methods to help ensure rigorous forensic practices.

"Lots of forensics is based on the how the evidence looks," NIST engineer Frank DelRio says. "We are trying to add another dimension, how things feel. How an object feels—its mechanical response—depends on the material and the object's history."

DelRio is an expert in atomic force microscopy (AFM), a precision tool with a mechanical probe typically used in basic sciences for imaging but also to measure responses to force, or pulling. He usually measures industrial materials like silicon. But he also watches a lot of CSI and thought his expertise could help answer national calls to enhance the accuracy, reliability and statistical rigor of forensics.

DelRio and NIST physicist Robert Cook recently used AFM to demonstrate quantitative methods for mea-



NIST researchers used atomic force microscopy (AFM) to measure the stickiness (pull-off force) and stiffness (plane strain modulus) of hair that was untreated (top), bleached (middle), and conditioned (bottom). The clear differences in the measured results for various hair treatments suggest that AFM might be used to analyze forensic evidence. The measured forces are very small, in units of nanonewtons or nN (1 nanonewton is about the weight of a pollen grain). Modulus is in units of gigapascals or GPa and ranges from 1-5 for the hair samples (for comparison, the plastic lens material polycarbonate measures about 3). Credit: DelRio/NIST.

suring—nondestructively and at the nanometer size scale—the mechanical properties of four types of evidence: hair, documents, fingerprints and explosives.

The researchers measured the stiffness and pull-off force (stickiness) for hair as a function of treatment, specifically conditioning and bleaching. They also measured these properties for test documents made to mimic forgeries marked with both ballpoint ink and printer ink, impression and pattern evidence such as how fingerprints change over time, and interactions of explosive particles and surfaces as a function of fabric type, rayon versus cotton.

The measurement results clearly distinguished various treatments of hair, types of ink, age of fingerprints and composition of fabrics, and related these data to the structure of the sample such as broken bonds in the hair and the smooth ballpoint ink versus the rough printer ink. Importantly, the measurements were rigorous—that is, precise enough to allow for tests and quantitative specifications of the statistical significance of the similarities or differences in properties. DelRio imagines that someday AFM might be used, for example, to measure old hair evidence and determine the probability that a criminal used a certain shampoo.

"This is all theoretical at this point," DelRio notes. "For this to be an effective practical tool, a lot of baseline measurements and in-depth studies would need to be done to develop a good sense of how these properties change over time."

In addition, DelRio notes that AFM calibration methods and standard samples or other methods for specifying accuracy would need to be developed to enable accurate comparison of measurements across laboratories. Also crucial would be the development of an experience base to build trust in AFM techniques, requiring widespread availability of instruments, training, protocols and standards for forensics labs, the paper notes.

Paper: F.W. DelRio and R.F. Cook. Quantitative Scanning Probe Microscopy for Nanomechanical Forensics. 2016. Experimental Mechanics. Posted online Oct. 31, 2016. DOI:10.1007/s11340-016-0238-y.

Metrology Outreach in Mexico

Georgia Harris
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Georgia Harris, National Institute of Standards and Technology (NIST).

Georgia Harris, National Institute of Standards and Technology (NIST), recently spent two weeks working with Flora Mercader at the Politecnic Universidad de Santa Rosa Juaregi (UPSRJ) in Queretaro, Mexico through a Fulbright Specialist Grant and partnership with the university from October 29 to November 13, 2016.

She conducted the NIST Office of Weights and Measures 5-day seminar, “Fundamentals of Metrology,” for 12 professors/instructors from seven universities and for two staff members from the Centro Nacional de Metrologia (CENAM) as part of an effort for ongoing professional development of engineering instructors related to integrate metrology concepts into the engineering curriculum. In addition, she provided a three-day train the trainer workshop for 16 instructors on project-based and activity-based learning as a way to increase the level of comprehension and application of metrology concepts.

A panel on "Best Practices in Metrology Training" was facilitated at CENAM by Dr. Salvador Echeverria and speakers included: Ms. Harris, Ismael Castelazo, Flora Mercader, and Hugo Hernandez. Each person shared information and data about their respective programs and recommended best practices. Ms. Harris, in collaboration with Dr. Salvador Echeverria Villagomez, has previously provided a train-the-trainer tutorial for CENAM instructors at the CENAM Simposio.

Several activities in Queretaro involved outreach to students. A one-hour lecture on "How do you know your measurements are right?" was presented at UPSRJ for about 80 first-year students and at CENAM for about 40 participants, some of whom were advanced PhD students. The "How do you know" session was designed to be an outreach presentation for students through a "Story of Thermometry Measurement," and highlights women in metrology. It also touched on key metrology terminology such as the international system of units, traceability, calibration, uncertainty, accuracy, and precision.

A three-hour lecture was also presented on the "Essentials of Measurement Traceability." This session integrates who's who in the world of metrology, VIM definitions, and risk based assessments of gaps in traceability evidence. The "Essentials of Measurement Traceability" session was presented at UPSRJ for about 50 third and fourth-year students, and at CENAM for about 15 participants.

Dr. Victor Lizardi, Director of CENAM, presented Ms. Harris with an "Activist of Metrology" certificate and presented all presenters with certificates for their participation in the panel session.

Joe D. Simmons
NIST (NBS) (1963-1994)

1992 NCSLI, William A. Wildhack award winner.
1995 MSC, Andrew J. Woodington award winner.
Co-founder and Chair of
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Early Career Professionals: Industry & Military

Leah Lindstrom
leah.c.lindstrom@boeing.com

Left to right: Matt Aloisio, Radian Research; Cody Luke, The Boeing Company; Leah Lindstrom, The Boeing Company; Jennifer Fleenor, Tektronix; Travis Gossman, Rockwell Collins.

The 2016 NCSL International Annual Conference in Saint Paul, Minnesota was the first occasion Committee 157, Early Career Professionals: Industry and Military was introduced to the organization. The committee held a panel presentation, mediated by Jennifer Fleenor of Tektronix. The panel consisted of four core members of the committee: Matt Aloisio, Radian Research; Travis Gossman, Rockwell Collins; Leah Lindstrom, The Boeing Company; and Cody Luke, The Boeing Company.

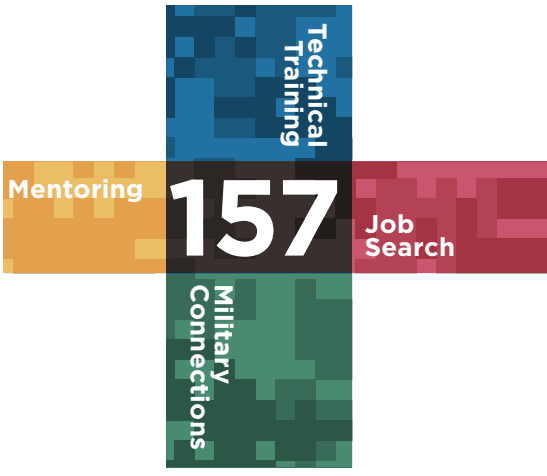
The open discussion platform was initiated by a brief introduction to the committee and the four core pillars that will be the backbone of its establishment. Those pillars include Technical Training, Job Search Support, Military Connections and Mentoring. The main goal of the committee is to become a resource to NCSLI members as a "one stop shop" for tools and skill development required for a successful transition into the testing world.

Many companies are currently struggling to bridge the gap between experienced professionals and the early career professionals. The overwhelming response in attendance from both sides of the spectrum was a testament to the importance of this dialogue and the need for strategic support. The discussion brought forth strong responses from the attendees wanting to share their experiences and lessons learned.

One main discussion was the common struggle with formalized technical training that also includes mentorship. Establishing a mentorship mentee program is sought out by many members to aid in the transition of knowledge and experience. NCSL International is seen as the technical resource for many organizations and thus an obvious choice to champion an effort to develop or share the necessary tools for a successful career transition.

Following the panel presentation, the group held a committee meeting which, again, filled the room with members seeking to give and receive advice about career development. This led to a deeper discussion about how to attract new members and keep them active in NCSL International.

Currently, the committee has a series of posts for LinkedIn that are designed to provoke online discussion as well as host follow-up discussion meetings. The committee is growing, but is still seeking new members to participate in any capacity available. If you would like more information about the committee, please reach out to us on our LinkedIn Group: NCSLI Early Career Professionals.



Metrology 2017

Measurements for transport

Bureau International des Poids et Mesures

OIML

INM
Instituto Nacional de Metrología de Colombia

World Metrology Day
20 May
www.worldmetrologyday.org

NCSL International Recommended Practice RP-5 Measuring and Test Equipment Specifications

Howard Castrup
NCSLI Equipment Specifications Committee

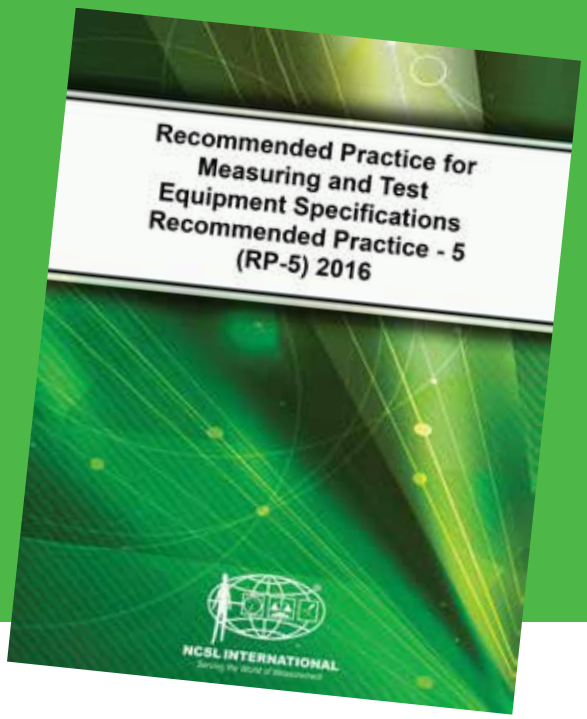
NCSL International has released a new edition of *NCSLI RP-5* "Measuring and Test Equipment Specifications." The updated edition was edited and developed by NCSLI 144-1 Equipment Specifications Committee. This recommended practice is intended to provide recommended practices for developing, reporting, obtaining, interpreting, validating, and applying measurement and test equipment (MTE) specifications. MTE specifications are an important element of cost and quality control for testing, calibration and other measurement processes. They are used in MTE selection and in the establishment of suitable equipment substitutions for a given measurement application. In addition, specifications are used to estimate bias uncertainties and establish tolerance limits for MTE attributes and parameters. Detailed examples are included to educate, demonstrate, promote and reinforce best practices.

With this third update, there are adjustments that have been made to the recommended practice's formulas, terms, clarifications and overall document format. Specifically, equation unit usage within

NCSLI RP-5 has been updated to ensure that each unit utilized within the practice's equations is consistent and accurate to what is currently standard today. Changes have also been made to the appendixes in the recommended practice such as an outline of transfer functions being given its own appendix section. The new appendix, along with various sections in *RP-5*, will help to provide an excellent first step toward instrument modelling and true uncertainty and traceability propagation through a measuring instrument. This approach, developed further in future editions, will in time remove artificial limitations imposed by warranted specifications in that regard, relate instrument reliability to parameter reliability, and provide innumerable refinements to the metrology field.

NCSLI RP-5 is available to download at no charge to NCSLI Members!

Non-members may purchase *NCSLI RP-5* at www.ncsli.org.



Group photo at Fluke Corporation.

Washington/Oregon

Wesley Thompson
wesley.j.thompson@boeing.com

The Washington/Oregon section meeting was held December 14, 2016 at Fluke Corporation in Everett, Washington. The meeting was well attended by measurement scientists, technicians and students from various industries across the Northwest. Students from the University of Washington, Washington State University and Department of the Navy were represented at the meeting as well.

Our meeting was organized to showcase presentations from our guest speakers with networking and exhibitor breaks throughout the day. Exhibitor tables were well received and very interesting. Attendees would become so engrossed in the demonstrations, it was sometimes difficult to bring them back to our presentation room.

The opening presentation was given by the NCSLI Northwestern US Region Coordinator, Mons Lee. He described the history and benefits of membership in NCSLI. One benefit that he touched upon was access to a wealth of technical publications, which allow a laboratory to quickly identify areas to improve upon, or how an organization can comply with national standards.

Jeff Gust from Fluke Corporation presented decision rules and measurement risk updates in the new *ISO/IEC 17025*. The newest draft of the document better describes consumer risk and how a certification laboratory should document their decisions to achieve that level of risk management. Mike Schwartz from Cal Lab Solutions covered how automation though Metrology.NET can take advantage of fully distributed computing systems using various service protocols. Jack Somppi from Measurements International presented improvements on their quantum hall resistance system. He specifically highlighted the improvements in helium recapturing and the reduction of measurement uncertainty to 0.005 ppm.

Andrew Hickson from The Boeing Company presented on the adaptation of a medical Plethysmography liquid

Jack Somppi, Measurements International.

metal strain gage to aerostructures. Directly following lunch, we had a brief presentation by Jennifer Fleenor from Tektronix on the NCSLI Early Career Professionals Committee. This newly founded committee looks to support industry professionals develop their career path in measurement science through mentorship, guidance and technical training.

Dr. Fritz Stahr from the University of Washington School of Oceanography presented on calibration troubleshooting of instruments used in deep ocean experiments. The issues identified in the presentation were in regards to poor reproducibility of calibration techniques. Our final presentation came from Dr. Yi-Hua Tang from the National Institute of Standards and Technology (NIST). He presented a history of the NIST watt balance and the redefinition of the kilogram. All presentations were very well received and the questions from the attendees were quite insightful.

Our meeting concluded with a tour of the Fluke Calibration labs that included stress and incursion testing, pressure calibration and the electronics primary lab where the Fluke josephson voltage standard was undergoing preliminary inter-laboratory comparison work with NIST.

A great many thanks to Jeff Gust and Marty Kidd from Fluke for their willingness to host this meeting and all the organization in getting this pulled together. Jennifer Fleenor, Mons Lee and Tony Reed were a great help as well with getting the meeting put together.

Thank you very much to our exhibitors, we really appreciate all your support and education. We would also like to thank NCSL International for its continuous support of the metrology community. We look forward to our next meeting and we hope to see you there!

Philadelphia meeting hosted by Micron.

Philadelphia

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It was a beautiful fall day on October 20, 2016, when the NCSL International Philadelphia Section Meeting was hosted by Avyayam Dave, Micron Inspections & Calibrations, at the Homewood Suites by Hilton York in York, Pennsylvania. Following the meeting, attendees were given a tour of Mircon's York facility.

Micron Inspections & Calibrations operate in York, Pennsylvania specializing in dimensional inspection, medical device dimensional validation/testing, contact and non-contact dimensional inspection, gage and mechanical calibration, electrical calibration and 3-D scanning and inspection. Micron is accredited through the American Association for Laboratory Accreditations (A2LA) to *ISO/IEC 17025:2005* and *ANSI/NCSL Z540-1-1994*.

Prior to our first speaker, the attendees were informed of the opportunity to attend the two-day NCSLI Technical Exchange held at the Florida Hotel & Conference Center in Orlando, Florida from January 23-24, 2017. Everyone was excited about the measurement training program agenda, so we hope everyone made it.

We were pleased to welcome five dynamic speakers from three, highly respected companies and organizations: Morehouse Instruments, the National Institute of Standards and Technology (NIST) and Fluke Calibration.

Henry Zumbrun from Morehouse Instrument Company presented "Have You Considered Local College Interns to Help Your Business?" His presentation utilized experiences from his own business and described the mutual attributes and contributions that came with employing two interns from York College. We enjoyed the presentations by the two interns, Ian Kruper and Shawn O'Brien. Each intern presented their contribution to Morehouse.

Ian integrated a new digital indicator with existing software and developed new automated calibration software with deadweight machines. Shawn, meanwhile, worked on the calibration system for automation and provided in-house customized solutions for PLC replacement. Shawn also replaced outdated closed software.

Our next presentation was by Dean Jarrett from the National Institute of Standards and Technology (NIST). Dean Jarrett has worked at NIST in the high resistance laboratory developing automated measurement systems and improved standard resistors to support high resistance calibration services and key comparisons. Dean provided an interesting overview of the historic development of resistance standards and measurements at

NIST/NBS, to the present. Can you imagine resistance measurements have been made at NIST for 115 years? We were delighted Dean had a display of very old resistor samples to view. Dean addressed barometric pressure correlated to post calibration changes. He also focused on measurement methods and influence factors to consider when making DC resistance measurements. Dean also shared measurement techniques and resistance scaling used at NIST.

After lunch, we were happy to welcome Michael Coleman from Fluke Calibration who presented "Thermocouple theory calibration system; including calculations, characteristics: voltage to temperature conversion and calibration schemes and equipment." Mike's expertise is in contact thermometry. He addressed the most common temperature scenarios and the source of errors in thermocouples. Because of the after – lunch presentation timeline; Mike came fully prepared to keep everyone's attention with bags of chocolate shared with everyone.

Our meeting culminated with a small road-trip when our group traveled one mile down the road for a visit and tour of the Micron Inspections & Calibrations facility. We were warmly greeted by the Micron staff as we toured their facility with refreshments to follow. Avyayam Dave also extended an invitation to a mobile dimensional calibration and inspection company, "Fowler" for the attendees to explore.

Our attendees received a day of learning, networking and the opportunity to visit a facility specializing in dimensional metrology. Thank you to all the attendees for completing the meeting survey; we received 100% preference from our attendees to have "hands-on" learning methods for our future meetings.

Our sincere thanks to our host, Avyayam Dave, and sponsor, Micron Inspections & Calibrations, for supporting this section meeting. We appreciate the support from all who assisted with the planning, preparation and participation to make this meeting memorable.

A special thank you to our guest speakers: Henry Zumbrun, Dean Jarrett and Michael Coleman for their expertise, topic selections, and time. We would also like to thank NCSL International for its dedication to supporting the metrology industry here in the US and abroad. We hope you will all join us in the spring for the next NCSLI Philadelphia Section Meeting at Exelon PowerLabs on April 19 & 20, 2017. This meeting will knock your socks off, so do not miss out!

Donna Lodek, Avyayam Dave, Mike Coleman, Henry Zumbrun, Dean Jarrett.

Henry Zumbrun, Morehouse Instruments.

Mike Coleman, Fluke Calibration.

Fowler, a mobile dimensional calibration and inspection company.

North Texas

Amy Guthrie
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The NCSLI North Texas regional meeting was held October 28, 2016 at MATSolutions in Irving, Texas. We had 21 attendees, some coming as far as Minnesota and Houston, Texas.

The meeting started with an announcement regarding the rejuvenation of the North Texas regional meetings. We strongly urged our community to help spread the word about NCSL International to friends and colleagues. We asked for creative ideas on topics such as hosting meetings, reaching out to our student communities, and developing demonstration programs.

We introduced Cary Albert, CEO of MATSolutions, to do an introduction of his company and metrology services. MATSolutions sells certified used test equipment and provides calibration services from their accredited calibration and repair laboratory in their corporate-owned facilities. Following Cary, we had an NCSL International update from Chris Grachanen, HP Houston Metrology Group.

North Texas meeting hosted by MATSolutions.

Our first presentation was led by Martin Kidd of Fluke Calibration and was titled "The Metrology behind wideband/RF improvements to Fluke Calibration 5790B." His presentation covered the evolution of through-hole components to surface mount components and the Restrictions of Hazardous Substances (RoHS) directives have driven the need to redesign the 5790A. In addition to the component changes, many improvements to the operation of the product were made. The U.S. Air Force requested that the wideband frequency measurement range to be extended to 50MHz, which would also enable the 5790B to calibrate the 50MHz 1 mW reference output that is common to many RF power meters. This presentation provided a review of overall improvements to the 5790B, challenges to the project, and information on the calibration methods used along with the validation of methods and metrological confirmation of the instrument itself. It was an excellent presentation and received positive, open feedback from the audience.

Our second presenter was Philip Castle, also of Fluke Calibration, with a presentation on "The Advantage of Portable Humidity Generators." Accurate humidity measurement and control is becoming ever more important to a number of industries. For example, many companies are seeking ways to use humidity measurements to prevent damage to electronic components during manufacturing and to prevent mold in food storage; these issues of prevention are especially important to the pharmaceutical, medical and paint industries, to name but a few. Many environmental humidity sensors are semi-permanently installed and need to be calibrated in-situ. Most solutions now are single point verifications, which can be insufficient, as a two (or more) point calibration, possibly including adjustment, is required for optimum sensor performance. Philip's presentation was entertaining and was relevant for everybody in the room, regardless of their measurement science background.

After a quick break, Chris Grachanen provided an update on The U.S. Government recognizing Calibration Occupations in the workforce. This was a fascinating topic as it deeply affects our community and experts in the field of metrology. What a great success to see the hard work paying off for recognizing this important need in industry standards.

MATSolutions Lab Tour.

Chris Grachanen, HP Houston Metrology Group.

Martin Kidd, Fluke Calibration.

Lunch was provided by Fluke Calibrations – a huge thank you goes out to them for sponsoring this!

After lunch, Charles Ellis of NAPT gave us his presentation on "20 Years of Lessons Learned in Proficiency Testing and Inter-laboratory Comparisons." Not only did Charles travel the farthest to join our group for the day, but his presentation was meaningful, engaging, and had great audience participation. He showed us the results and lessons learned from providing thousands of evaluations on labs, and all the while creating fun banter for our group.

Our final presentation was provided by Gary Schmidt of MATSolutions. Gary's presentation was titled "RF – What is it? Why Measure it?" His presentation was well received and interesting to the whole audience, regardless of their background, because RF applies to our personal and commercial lives.

Rounding out the day we had a tour of the MATSolutions Calibration Lab. They have a 6000-square foot state-of-the-art calibration and repair lab that is accredited to *ISO/IEC 17025:2005*, *ISO 9001:2008*, a 68-degree Cold Room, and U.S. Military trained technicians. Capabilities include DC to 50Ghz, and specialized medical/industrial/testing industries. Unique to MATSolutions is their in-house repair capabilities to perform component-level test equipment repairs. They can cover most manufacturers' products, including vintage and obsolete models.

Throughout the day, we had an exhibit table provided by Fluke Calibration, took a group picture, networked, and had a lot of fun with entertaining presenters and leaders.

Thank you to MATSolutions for hosting the meeting, providing breakfast and giving us a great tour of their facility. We would like to thank all attendees for supporting the revitalized North Texas meeting and Fluke Calibration for sponsoring and exhibiting. We would also like to give a thank you to NCSL International for providing a foundation for our meeting and others across the world. Our next meeting will be held in March. If you are an NCSLI member and have interest in joining our steering committee, please contact Amy Guthrie.

Philip Castle, Fluke Calibration.

Charles Ellis, NAPT.

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Canadian meeting hosted by NRC.

Canada

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The NCSL International Canadian Region held their annual meeting September 28 and 29, 2016. The meeting was held on Canada's beautiful east coast in Halifax, Nova Scotia with the National Research Council (NRC) hosting the meeting at their Oxford location. NRC's location, with its spacious presentation theatre, provided an excellent venue for everyone in attendance. Keeping up with Canada's east coast hospitality, a meet and greet was held the evening before at the The Delta Halifax Hotel. This turned out to be a great social event and networking opportunity for all in attendance.

NRC hosted a "Measurement Uncertainty" workshop on the September 27. This workshop was available to all attendees wishing to participate. It was intended to help attendees understand measurement uncertainties by providing the basics of evaluating and expressing uncertainty in a practical sense. The workshop came with a complete step-by-step walk through of how to manage uncertainty that included hands-on exercises. The workshop facilitator was Jeff Russell from NRC's Calibration Laboratory Assessment Services (CLAS). Jeff's 20 years of experience with uncertainty analysis made him the perfect instructor, so the workshop was a well-received success.

After registration, and some coffee, on the first day of the meeting, we were welcomed with some opening remarks from Ingrid Ulrich. Ingrid is the NCSLI Anthony Ulrich Metrology Scholarship Committee Chair. Ingrid is currently the Vice President of Ulrich Metrology. Also, as part of the welcome, we heard from Georgette Macdonald of NRC whose association with NCSLI began over 15 years ago. Georgette is the NRC Representative to the NCSLI Board of Directors. Georgette works in the Scientific Support Department for the National Measurement System Program as the program leader and a research

Jack Somppi presenting 100 Year Anniversary Plaque from NCSLI to Georgette Macdonald of NRC Canada.

Carlos Sanchez, NRC.

director. She has also been a group leader and technical advisor with the Calibration Laboratory Assessment Service (CLAS) at NRC since 2002.

Our first technical presentation came from Jack Somppi, VP of Business Development with Measurements International. Jack is the NCSLI VP of Marketing. His presentation, "Not All Resistors Are Created Equal," examined the different alternatives found in modern standard resistors, the pros and cons offered to the user through these differences, the benefits found with different measurement techniques, and the sources of error to consider in precision resistance measurement.

Following Jack's presentation, we heard from Ghislain Granger of NRC. Ghislain spoke about "AC Voltage Measurements" and how they have been traceable to DC voltage via primary sets of thermal converters characterized for their AC-DC transfer difference. He went on to explain how in the evolution toward the new SI based on fundamental constants it was discovered that a Josephson Arbitrary Waveform Synthesizer (JAWS) can be used to generate quantum-accurate AC and DC voltages based on the Josephson constant, Kj=2e/h.

After a morning coffee break and an opportunity to visit some of the exhibitors, we heard from Philip Castle. Philip is a product manager with Fluke Calibration, specializing in temperature and humidity calibration and applications. His presentation gave us some in-sight to the advantages of portable humidity generators. Accurate humidity measurement and control is becoming ever more important in many different industries. With many environmental humidity sensors, semi-permanently installed, in-situ calibration is usually required and typical single point calibration may not be sufficient. In response, Fluke has recently developed a portable humidity generator for performing multipoint humidity calibrations.

Following Philip Castle, our next presenter was another Philip, Philip Blanchard. Philip is a team leader and technical advisor within the Calibration Laboratory Assessment Service (CLAS) at NRC. His presentation

Tall Ship Silva.

examined how CLAS deals with special cases of metrology while explaining the differences in the many areas of metrology.

Our last presentation of the morning came from Richard Timmons, president and co-owner of Guildline Instruments Limited. Richard's presentation titled, "So – You Think You Know DC Resistance and Current Measurements," covered the operating essentials for DC resistance and current measurements. Richard also went into detail regarding contributions to uncertainty such as power and temperature coefficients, voltage coefficients, and individual drift of standards.

Following lunch, we had another presentation from Richard Timmons concerning "Direct Current Comparator (DCC) Bridges." His presentation explained techniques used to improve the DCC Bridge and how these advancements have been applied to DCC thermometry bridges, thus enabling a fast measurement at true primary level accuracy of 5uK or 0.02ppm at a real-world thermometry excitation of 1mA.

Canada's east coast, in particular Nova Scotia, is known for their forestry and fishing industry exports, but Nova Scotia's number one export is actually tires. In light of this, it would seem fitting to have a presentation

about tire manufacturing. Thankfully, Donald Sampson of Michelin Tire gave us such a presentation. Donald has more than 25 years' experience as a Michelin metrologist and provided us with great in-sight into what type of measurements are required to build a quality tire. His role includes training staff, participating in worldwide interlaboratory studies, and coordinating the maintenance and calibration of the equipment required to carry out all of these measurements. This leads to the quality and safety of Michelin tires produced in Nova Scotia.

Our last presentation of the day came from Georgette Macdonald. Georgette is on the NCSLI Working Group (WG44) for *ISO/CASCO* for the revision of *ISO/IEC 17025*. She provided us with an update on the process for the revision to *ISO/IEC 17025* and all the trials and tribulations (including thousands of email comments) that go into making those revisions.

After returning to the Delta Halifax Hotel, attendees made their way to the Halifax waterfront to board the *Tall Ship Silva* which set sail for a tour of the Halifax harbour. After a successful voyage, we all enjoyed a delicious buffet meal in the hotel's beautiful Baronet room.

Day two of the meeting again started with coffee, of course, and another chance to check out some of the exhibitors.

First up for presentations on day two was John Busald, regional production manager for Fluke Calibration. John spoke about understanding the challenges in producing uncertainty budgets for RF Calibrations. Topics included identifying key uncertainty contributions, dealing with linear and logarithmic units and the use of coverage factors and confidence levels when combining contributions.

Next, we heard from Bill Neil, technical officer at NRC. Bill has been involved with the NRC's Photometry and Radiometry team at the Measurement Science and Standards Department for eight years. He spoke to us about Solid State Lighting (SSL) becoming the predominant source of artificial lighting around the world and talked about the challenge of developing new standards for this type of lighting while it is still under development. This change in our source of optical radiation is causing significant disruption in our methods of measurement and the standards used.

After a short break, Duane Brown of Measurements International gave us a presentation titled, "The Pros and Cons of High Resistance Measurement System Techniques." Duane's presentation explored the different technologies used to make higher resistance measurements in the 10^5 to 10^15 Ohm with the need to improved accuracies and speeds over other conventional

technologies as conventional methods; especially for high-value resistors that are limited in accuracy and have long wait and measurements times.

Our next presentation came from Pam Reyno of AGAT Laboratories, a chemistry environmental testing laboratory. Pam's presentation asks the question, "If Chemistry is an exact science, why is there so much uncertainty?" With over 15 years of experience in chemistry laboratory environments, she clearly and accurately explained how these uncertainties are handled and improved upon. Some of the key factors on managing and reducing the uncertainties include: use of established validated methods with multiple levels of verification and scrutiny, use of certified reference materials, participation in proficiency testing studies, monitoring of equipment performance, and use of a well-established quality management system.

Up next we heard from Carlos Sanchez of NRC. Carlos has contributed to many projects in his 10 years working at NRC, including the NRC Kibble Balance which was the center of his topic. The NRC Kibble Balance, formally known as the WATT Balance, was renamed in memory of Dr. Bryan Kibble. Carlos updated us on the status and experimental details concerning the measurements of the Planck's constant, and the NRC Kibble Balance, and its impact on redefining the kilogram. The kilogram remains the only unit in the International System of Units (SI) which is defined by an artefact. The revision to the SI unit for the kilogram from the IPK to the use of plank's constant is expected in 2018.

After lunch, and one last chance to visit the exhibits, we had Rashida Patel of NRC give us an overview of the technical services and capabilities available at the NRC Measurement Science and Standards Department. It is well known that NRC is a world class research and technology organization, but she continued to explain how they work with clients and partners to provide innovation support, strategic research, scientific and technical services in order to develop and deploy solutions to meet Canada's industrial and societal needs.

Closing remarks came from Pearse McCarron, Biotoxin team lead of NRC, followed by tours of NRC's facilities including the NMR facility, zebrafish lab and biotoxin lab. I would like to thank NRC and their team for providing us with this wonderful venue for our meeting. A special thanks to the local organizing group which included Sheila Crain, Kelley Reeves and Andrew Oldershaw of NRC and Brendan Thomey of Pylon Electronics. It was great to be a part of this team. We would also like to thank Carlo Rea of Technel for his work on obtaining and organizing the exhibitors.

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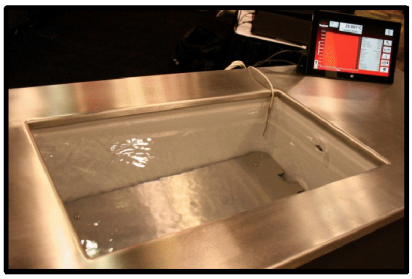

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