**EDITOR’S MESSAGE--**

**New Department**

Chris Grchanan and Georgia Harris have volunteered to create a regular chapter in the newsletter, called "Educator's Corner." It's always good to have someone volunteer to pull together a variety of subjects for a single page of information. See page 23.

**January issue distribution**

I detected problems with the delivery times for the January issue. I am aware that there was a major snowstorm in the Rocky Mountains the week of January 12-14 when that issue went to the USPS and international remail in Boulder. Yet the 2-3 week delivery time to U.S. readers was still longer than my expected times which have always rivaled first class. Periodicals is the class that regular commercial magazines use, and they expect first class handling.

Canada was a different story. January was the first time I tried the U.S. periodicals class for Canada readers and from feedback I got some readers still hadn't received their copies as late as Feb 10. That is clearly unacceptable, so for this issue I am back to my older practice of using first class for Canada readers.

The international—everything but the U.S. and Canada—distribution uses a process called remail, and that seems to be working fairly well.

**John Minck**

Editor
PRESIDENT’S MESSAGE

2005 Annual Workshop and Symposium

Washington DC is a great place to hold a conference with NIST being closeby and all of the great history of the DC area. Conference V.P. Carol Hockert and Conference Director Gary Jennings along with the conference committee are working very hard on the annual Workshop and Symposium that will be held at the Washington Hilton & Towers, Washington, DC on August 7-11, 2005. The theme of this year’s Conference is:

Advances in Science and Technology - Their Impact on Metrology

Dr. Haratch G. Semerjian is the acting director of NIST and we are honored that he has agreed to be the keynote speaker for the conference. Plan on attending; we will have 20 tutorial sessions that have been put together by Klaus Jaeger. They cover a wide range of topics that will be helpful to our membership. We have increased the number of tutorials each year to provide education opportunities for our members.

Dick Pettit and his committee have been working very hard to assemble an excellent technical program for the conference. On Tuesday and Wednesday we will have plenary sessions similar to the ones that were successful last year. Dick has had a very large number of very good papers submitted. Because of the large number of good papers, the program has been expanded to six paper tracks rather than the usual five tracks. We are making it harder for the attendees, now they will have six sessions to choose from rather than five. Dick reports that this should be one of the best programs he has worked with. Make your travel plans early to attend the 2005 conference; visit the NCSLI conference website at <http://www.ncsli.org/conference/2005> for details. For your information, the NIST tours are limited and are on a first-come basis. Just a note for the members who would like to save some money; the early bird registration ends MAY 3, 2005.

January Board Meeting

The NCSLI Board of Directors held its first meeting this year in Santa Barbara, CA. Three new members of the Board were introduced at the Board meeting. Malcolm Smith was appointed as the V.P.-International, Lonnie Spires was appointed as the V.P.-Northeast U.S., and Terry Conder was appointed as the V.P.-Central U.S. I would like to thank the new members for accepting the appointments and their management for lending their support to NCSLI.

In addition to the normal Board activities the Board held a Workshop on Education and Training Tuesday afternoon. Georgia Harris, the new of V.P.-Education and Training, coordinated the workshop. The workshop consisted of Board members and special guests who had an interest in Education and Training. The interchange was very good with the following major areas being discussed:

• Metrology Promotion
• Metrology Education
• Training Resources
• Technology Trend Analysis
• Training Opportunities
• Training Assessment and Certification
• Career Paths
• Personnel Qualification
• Knowledge Management
• Funding
• Collaboration

These are just some of the areas that were discussed. Georgia is requesting more information on Education and Training needs from NCSLI members. If you would like to provide additional information to Georgia, e-mail her at <gharris@nist.gov>. NCSLI believes this effort will provide us the strategic direction to provide future resources to our members on Education and Training.

NCSLI Training Facility

The NCSLI training center at the Boulder Office is now taking reservations for classes. Nine weeks have been booked already this year. To review these classes, please go to <http://ncsli.org>. Mitutoyo, Integrated Sciences Group, Fluke, and NIST have scheduled classes for 2005 also see page 24. One of my key initiatives is to increase the number of opportunities for NCSLI members to receive training. Please review the class schedule to see if there is a course that will work for you. If you are interested in teaching a course at the NCSLI training center, call Craig Gulka at 1-866-519-6275.

Annual NIST Visitation

On February 10, 2005, Dave Agy, Jeff Gust, and I met with Dr. Haratch Semerjian, Acting/Director, NIST and Dr. Belinda Collins, Acting/Director, NIST Technology Services to discuss metrology issues that were of interest to NIST and NCSLI. In addition to the meeting there was a tour of the new AML with presentations on National Electrical Standards by Dr. James Olhoff, Mass by Dr. Zenia Jabbour, and The Ultra-High-Accuracy Moore 48 CMM by Dr. Dennis Swyt and Dr. Ted Doiron.

During the discussions on Metrology issues, the following major items were discussed:

NIST Funding - The process to develop the NIST budget for 2006 has started. Currently the budget appears to be on track. There was a summary of the current status of the budget in the February 10, 2005 NIST Tech Beat publication (Look at the NIST website-Archives section) see also page 42. NCSLI members are encouraged to follow the progress of the NIST budget development and if there are changes to the budget that affect NCSLI members’ work to let your concerns be known.

Education and Training - NCSLI is looking to NIST to provide high-level train-the-trainer courses in addition to the Time and Frequency and Mass courses. The current initiatives of NCSLI in the area of Education and Training were outlined and what NIST could do to help was discussed.

(Continued on page 47)
Advances in Science and Technology continue at an ever-increasing rate, especially in the fields of Medicine, Nano-technology, Biology, and Space Sciences. These advances impact the metrology community in many ways, from requiring the support of new standards and parameters, to providing state of the art quantum standards, to computerizing and automating measurement systems. The 2005 NCSLI Workshop & Symposium will provide a forum to discuss the impact these advances have had on metrology, as well as other related issues.

Some basic examples illustrate the advances in Science and Technology that have shaped our current metrology practices. In DC Voltage, many metrologists started their career using saturated cells capable of maintaining the volt at 1 ppm. They then switched to commercially available solid-state Zener standards which could maintain the volt at 0.3 ppm. Today calibration laboratories have access to portable Josephson Junction array technology with uncertainties better than 0.05 ppm. This represents a 20-fold increase in capability! In the area of mass measurements, the balances used 25 years ago were a double pan design with a sensitivity of 4.0 micrograms. Today, you can purchase electronic balances with 0.1 microgram resolution, an improvement of over 40 times.

One challenge for the metrology community is to develop standards and calibration techniques to support these advances in science and technology. Both calibration laboratories and National Metrology Institutes are finding it increasingly difficult to not only maintain all of their existing standards and capabilities, but they must expand their capabilities to include a larger dynamic range, lower uncertainties, and improve their efficiency. In addition, they must also develop, implement and maintain brand new capabilities that did not exist only a few years ago.

Papers, Panels & Workshops:
The Technical program offers papers, panels, and workshops that explore this year's Conference theme, and are organized into the following five categories:

- Theoretical
- Applied
- Management & Quality
- International
- Invited

Exhibits:
Meet with key executives and leading technical experts from over 120 of the top Measurement Science industry innovators and suppliers from around the world. To keep pace with rapidly changing technology, this Conference is a must.

Networking:
The Workshop & Symposium affords unparalleled opportunities to meet with key individuals in the field of Metrology to collaborate and gain new information and insights that can help solve ongoing challenges with fresh perspectives, new skills and new partnerships. Examples of areas of involvement include automotive, analytical chemical, pharmaceutical, and forensics.

Tutorials:
The 2005 Conference will include a series of tutorials presented before and after the conference. There will be more tutorials this year than in past years. Some of the subjects to be covered include Temperature, Accreditation, and Uncertainty, among others. Please visit the NCSLI Website, www.ncsli.org, for the titles and abstracts of all of the 2005 tutorials.

Hotel Information:
Washington Hilton & Towers
1-800-Hiltons (445-8667)
Group Name: NCSLI International
Room Rates: Single $150
Double $160

For more information, please visit our website at www.ncsli.org/conference/
NCSL International
2005 Workshop and Symposium Registration
August 7-11, 2005 Washington, DC
Conference language: English
Conference currency: USD

Register on-line at www.ncsli.org

REGISTRATION FEES

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Sunset dinner cruise on the Potomac aboard the Dandy riverboat

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| Tour A - Physical/Dimensional
| Tour C - Optical/Physics
| Tour D - Neutron Research/Nanofabrication

Space limited to 36 people per tour. See flyer for tour schedule and descriptions. Tours run simultaneously and involve considerable walking. Tours limited to full conference attendees only. Valid official Government-issued ID or passport required. No private transportation allowed. No exceptions.

| NCSLI Membership for Organizations | $400 |

REGISTRANT INFORMATION (Please print or type)

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Organization: _________________________ Fax No.: _____________________________

Dept. / Div. / Lab.: ______________________ E-mail: _____________________________

Address: ______________________________ Industry Code: _____________________________

City: ____________________________ State / Province: __________________________

Special Accommodations: Please attach a written description if you require special ADA, wheelchair or dietary needs. Please note the only alternative meal option offered at this time is a vegetarian plate.

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CANCELLATION POLICY

Full registration fees will be refunded if written notice is received (by fax or mail) by July 11, 2005. You may transfer your paid registration to another individual from your organization to attend in your place without penalty. Written authorization for this substitution is required. Please mail or fax written notice of substitution to the NCSLI International business office to arrive by July 29, 2005.

FOR OFFICE USE ONLY

Registration Received: / / / CK # / CC App #: ____________________________ CK / CC App Date: / / /

Payment Received: / / / PO / Inv. #: __________ Amount: $ __________ Entered: / / /
NCSL International 2005 Workshop and Symposium
Tutorial Registration
August 6-12, 2005 - Washington, DC
Conference language: English
Conference currency: USD

REGISTRATION OPTIONS

Register on-line at www.ncsl.org
Fax or Phone Credit Card Registrations to:
   Fax: 303.440.3384 – Phone: 303.440.3339
Mail Check or Credit Card Registrations to:
   NCSL International, 2995 Wilderness Place, Suite 107, Boulder, CO 80301-5404

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<td>Sat. Aug. 6 8:00 a.m. - 12:00 p.m.</td>
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<td>T5 Measurement Uncertainty Made Easy</td>
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<td>T6 Very Low Pressure Calibration</td>
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<td>T7 Practical Modeling of Measurements for the Uncertainty Evaluation</td>
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Dept. / Div. / Lab: ____________________________  Fax No.: ____________________________

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CREDIT CARD INFORMATION

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Full name as it appears on card: ____________________________  Date: __________ / __________

Signature: ____________________________

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Payment Received: __________ / __________  PO / Inv. #: ____________________________  Amount: $ ____________________________  Entered: __________ / __________

NL 0105
TUTORIAL ABSTRACTS

Saturday, August 6, 8:00 a.m. - 12:00 p.m.

Fundamentals of Temperature Calibration
Thomas Wiandt & Ron Ainsworth
Hart Scientific, Inc.
American Fork, UT

This presentation is a review of the fundamentals of temperature calibration. Topics include calibration equipment, calibration techniques, curve fitting issues, and the mathematics important to thermometry. Types of thermometers covered include platinum resistance thermometers, thermistors, thermocouples, and combined thermometer/readout systems. This segment is intended for those who are new to temperature calibration, those who need to validate what they already know, or those who just have some nagging questions that need to be answered.

Balance and Scale Calibration & Use
Val Miller
National Institute of Standards and Technology
Gaithersburg, MD

Weighing processes are a significant part of many manufacturing and analytical processes. This tutorial will present an overview of the calibration and use of weighing devices in the analytical environment. It will focus on the use of weighing techniques, correct procedures, eliminating and minimizing sources of errors, and compliance with the weighing requirements of the USP, FDA and ASTM. Classification schemes and calibration procedures for balances and scales will be covered. The approach will discuss the selection and use of standards, artifacts, procedures, facilities, equipment, measurement assurance, and software to determine how each contributes to the quality of mass measurements, the impact on the overall laboratory capability, and the effect on the production environment.

Saturday, August 6, 1:00 p.m. - 5:00 p.m.

Temperature Calibration Uncertainty Analysis
Thomas Wiandt & Ron Ainsworth
Hart Scientific, Inc.
American Fork, UT

This presentation is a step by step review of the tools necessary to evaluate the uncertainties present in temperature calibration. Topics include curve fitting errors, error propagation, error budgeting, TURs, and statistical process control. Also discussed will be pertinent fundamentals of uncertainty analysis as outlined in the Guide to The Expression of Uncertainty in Measurement (GUM). This segment is intended for those who are new to uncertainty analysis as well as those who are well versed but require further guidance or clarification.

Balance and Scale, and Weighing Process Uncertainties
Val Miller
National Institute of Standards and Technology
Gaithersburg, MD

One requirement of traceability of measurement results is calculating the associated measurement uncertainty. This tutorial will present concepts and methods for calculating and evaluating the uncertainty of balance and scale calibrations. Weighing processes in the industrial and analytical environments will also be discussed. Attention will be focused on the sources of errors in weighing operations, methodologies for estimating the magnitude of errors, and computation and reporting of the measurement uncertainty associated with reported weighing measurement results. This approach is based on the content of NIST IR6919, Recommended Guide for Determining and Reporting Uncertainties for Balances and Scales.

Measurement Uncertainty Made Easy
Mike Ouellette
National Research Council Canada
Ottawa, ON Canada

Why is it important to express the uncertainty in measurement? Quite simply, there is no traceability in measurements that lack statements of uncertainty at every link of the traceability chain. For this and other reasons, ISO/IEC 17025 requires calibration laboratories, in particular, to provide estimates of uncertainty of their measurements using accepted practices. The instructor will discuss the basics for preparing uncertainty estimates for typical uncomplicated measurement processes. His approach is consistent with the GUM but it dispenses, wherever possible, with the algebraic notations, statistical jargon, arithmetic modeling, and differential calculus operations found in the GUM that perhaps encumber a person who requires no more than a simple, conservative estimate of the uncertainty in the result of a simple measurement process. For these situations, it will be shown that the mathematics is quite straightforward and that the actual challenge, if any, to estimating uncertainty in measurement is in defining the factors that affect the measurement; namely, in understanding the metrology. Participants will receive an example Excel spreadsheet for making simplified uncertainty calculations. The tutorial will include a group exercise. Participants should bring stationary and pocket calculators.

Sunday, August 7, 8:00 a.m. - 12:00 p.m.

Very Low Pressure Calibration
Karl Kurtz, Mike Bair and Matt Daniels
DH Instruments, Inc.
Phoenix, AZ

This course focuses on the special challenges of very low gauge and differential pressure calibration. Topics range from the fundamental concepts of pressure measurements to the unique practical issues encountered in hardware setups, data acquisition and the measurement process. The calibration influences that become dominant at very low pressure are analyzed. Participants experience hands-on measurement exercises illustrating the points discussed.

Practical Modelling of Measurements for the Uncertainty Evaluation
Measurement of Temperature, Pressure and Electrical Quantities
Dr. Klaus-Dieter Sommer
Thüringian State Bureau for Metrology and Verification (LMET)
Jena, Germany

The modeling of the measurement is a key element of the evaluation of measurement uncertainty in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). It is the aim of the modeling procedure to mathematically establish the relationship between the measure and all input quantities, which may contribute to the uncertainty associated with the measurement result. This relationship serves as a basis for the uncertainty propagation as well as for computer-aided uncertainty determination. Since neither the GUM nor other relevant uncertainty documents provide any guidance on the modeling of measurements, the modeling of measurements appears to be the most difficult problem of uncertainty evaluation in accordance with the GUM.

With a view to overcome this problem, a straightforward and highly versatile modeling procedure has been developed which is based on the idea on the classical measuring chain. It is structured into five elementary steps, and only three types of modeling components are employed. Furthermore, it will be shown that almost all measurements and calibrations can be reduced to only a few generic model structures, which, on their part, can easily be tailored to the particular measurement procedure.
The tutorial will give an introduction to the above modeling concept with numerous examples from measurement and calibration in the steady state. The main focus will be laid on the measurement of temperature, pressure and electrical quantities. On the basis of both comprehensible and -if desired- advanced exercises and practical examples, the participants will be qualified to systematically analyze and perform the modeling of their measurement and calibration procedures with a view to mathematically establishing the so-called model equations.

Due to the limited number of participants, to a certain extend there will be the possibility given to individually discuss particular modeling problems.

**Laboratory Accreditation: The Process from A to Z**
Dana Leaman
American Association for Laboratory Accreditation (A2LA)
Frederick, MD

What does one need to know regarding the accreditation process to 17025? What should be expected? Where does one start? The accreditation process can be very confusing for anyone. Knowing what to expect throughout the accreditation process can alleviate much of the confusion and make the entire process a positive learning experience.

ISO/IEC 17025, “General requirements for the competence of testing and calibration laboratories” is the internationally recognized standard for determining the competency of testing and calibration laboratories. The American Association for Laboratory Accreditation currently operates an Accreditation program to ISO/IEC 17025 within eleven major fields. This paper discusses the steps of our accreditation process from beginning to end offering insights into avoiding many of the pitfalls of the process.

**Running an Effective Laboratory - Measuring Performance**
(Sponsored by the NCSLI Small Business Initiative Committee)
Greg Powell Malcolm Smith
The Signal Group NCS Laboratories
Seattle, WA Vancouver, BC
Canada

This tutorial will be of interest to owners, managers, and supervisors of calibration laboratories, both in-house and commercial. The tutorial will cover four areas where performance measurement is important in the running of a laboratory: productivity, finance, marketing and customer satisfaction. The range of measures that can be used to monitor performance in each of these areas will be discussed. Suggestions on how these measures might be used in practice and in concert will be reviewed. Examples of measurements, with discussion of their effectiveness and appropriateness for process improvement, will be given.

**Good, Bad, or Indeterminate: Using Guardbands to Help Make the Call**
David Deaver
Fluke Corporation
Everett, WA

When calibration data is provided on a certificate, ISO 17025 requires a statement of the measurement uncertainty. In addition, if a statement of compliance with specifications is made, the uncertainty of measurement must be taken into account. This tutorial will describe some practical ways to consider uncertainties when making in-tolerance or out-of-tolerance declarations.

**Measurement of Customer Satisfaction: An application of "soft" metrology**
Jean-Claude Krynicki
Agilent Technologies
Palaiseau, France

What is customer satisfaction and how to measure it? Available methods to gather satisfaction data; How to build a pertinent customer satisfaction study questionnaire? Measurement process : Measurement uncertainties; Results interpretation and conversion into actionable items; More advanced methods; Inventory of resources.

Upon completion of this module the student will be able to design a customer satisfaction measurement tool, to perform a reliable interpretation of the result, to design presentations for Management reviews, to build a customer satisfaction dashboard.

**Sunday, August 7, 1:00 p.m. - 5:00 p.m.**

**Very Low Pressure Applications**
Karl Kurtz, Mike Bair and Matt Daniels
DH Instruments, Inc.
Phoenix, AZ

This course is intended to follow the NCSLI tutorial "Very Low Pressure Calibration" given at the 2004 and 2005 NCSLI Workshop and Symposium. Specific low pressure calibration applications are set up for discussion and hands on calibration training. Data taken during the hands on sections is analyzed and the uncertainties associated with the influences present in the calibration process are discussed in detail. Specific problems experienced by students either in their own labs or during the hands on section are discussed as time permits.

**Evaluating Measurement Uncertainty in Chemical Laboratories**
Wolfgang Richter
formerly at Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany
Klaus-Dieter Sommer
Thuringian State Bureau for Metrology and Verification (LMET), Ilmenau, Germany

Results of chemical analyses are often used as a basis for important decisions and agreements, particularly in such fields as health care, environmental protection, or international trade, and must therefore be reliable and trustworthy. Knowledge of measurement uncertainty, based on metrological traceability, is an important prerequisite for creating confidence in the quality of measurement and analytical results.

The ISO/BIPM Guide to the Expression of Uncertainty in Measurement (GUM) together with the EURACHEM/CITAC Guide to Quantifying Uncertainty in Analytical Measurement are accepted worldwide as master documents for evaluating measurement uncertainty in a uniform and consistent way.

The tutorial will give an introduction to the concepts of these documents and will provide both, the necessary knowledge and practical "recipes", for the evaluation of the uncertainty of analytical results.

Emphasis will be laid on practical examples. These will cover typical applications of chemical analysis often occurring in practice such as, for example, the determination of lead in water using atomic absorption spectroscopy (AAS) and the determination of pesticide residues in a natural matrix. The tutorial will also address the proper use of data from interlaboratory studies and from method validation, which are available in most laboratories, for uncertainty evaluation. The participants will be enabled to evaluate the measurement uncertainty for analytical tasks that typically can be found in every day’s laboratory practice.
Pipette Calibration and Use: Reducing Variability via Uncertainty Analysis and Bench-top Verification
George Rodrigues, Ph.D.
Artel
Westbrook, Maine
This workshop combines practical advice with hands-on experience for metrology managers, engineers, and calibration technicians. Participants will learn: Practices for the creation of an uncertainty budget for your pipette calibration program, as a prerequisite for 17025 accreditation and/or for identification of the most significant error sources. Simple and cost-effective strategies for mitigating the leading sources of liquid delivery variability in the laboratory; including environmental factors, operator technique, and undetected pipette failures. The focus of the workshop is on bringing the business value of metrology from the calibration facility to the process level -- to improve quality, reduce mitigation risk and lower calibration and rework costs. By addressing calibration concerns on the bench-top, the metrologist can have a positive effect on the bottom line while actually enhancing control over laboratory processes.

Friday, August 12, 8:00 a.m. - 12:00 p.m.

Advanced Topics in Uncertainty Analysis
Howard Castrup, Ph.D.
Integrated Sciences Group
Bakersfield, CA
This tutorial examines methods and techniques of uncertainty analysis taken from the GUM, other published work and current research. Widely used statistical uncertainty analysis tools will be derived from scratch, allowing a discussion of their utility and applicability. In addition, methodologies, such as Monte Carlo, Bayesian, ANOVA, and SPC will be discussed and an error analysis model will be developed that provides a rigorous framework for uncertainty analysis. Concepts will be illustrated using shareware and commercially available software.

Laboratory Data Management: “If the Data Don’t Match, then the Answers Won’t Hatch.”
Donald W. Wyatt, President
Diversified Data Systems, Inc.
Tucson, Arizona
This tutorial is intended for calibration managers, metrologists, or information technology professionals with responsibility for developing or maintaining calibration data management systems. The tutorial methodically reviews the data that needs to be captured, validation guidelines that can ensure the integrity of the data, and the analysis and reporting that can improve the efficiency and productivity of a calibration lab. The scope of the tutorial includes data required for regulatory compliance, data necessary for process control, data sought by customers of the lab, as well as data valuable for business unit management and administration.

Attendees will gain valuable insights and understandings, which will benefit either the search for a new data management system or the quest to improve an existing system.

Inventory Data Normalization: The Whys, Wherefores and Techniques
Charles A. Motzko, P.E.
C. A. Motzko & Associates
Tucson, AZ
This tutorial examines the data normalization process for new or existing calibration and equipment management databases from both a practical and theoretical perspective. Alternatives will be discussed to deal with legacy systems as well as migration strategies for 4G databases. The operating premise is that data should be treated as the most valuable resource, but without a clear way for the enterprise to define, interpret or reference, the data is meaningless. Examples and checklists will be presented to illustrate multiple approaches to the normalization or migration process. Problem brainstorming and topical discussion will be encouraged.

The Shocking Aspects of ESD: Things You Should Know About Electronic Discharge
Patrick André
André Consulting, Incorporated
Bothell, WA
Electromagnetic Discharge, ESD, is often a misunderstood and undetected threat to electronic components and assemblies. More than antistatic mats and wrist straps, ESD control must be understood where ever electronics are handled. This course will cover tribocharging and current exchanges; types and differences of protective materials; ionizers; coatings and cleaners; and various types of mats, wrist straps, and foot worn discharge products. War stories will range from the common to the bizarre.

Measurement System Analysis Handbook for the Automotive Industry
Steve StahleyCummins, Inc.
Columbus, IN
The Automotive Industry Action Group Measurement Systems Analysis Handbook or AIAG MSA is the guiding document for service providers and manufacturers to the Automotive industry in establishing measurement systems capabilities. The MSA provides guidance on how to evaluate and quantify sources of measurement error and variation. It then provide guidelines to determine if a measurement system has the appropriate accuracy to perform the requirement measurements, typically comparing measurement systems accuracy to product specification. The MSA is referenced by ISO/IEC TS 16949 and other quality tools called out by TS including PPAP (Product Part Approval Process) and APQP (Advanced Product Quality Planning). The MSA Third Edition has been updated to consider the life cycle of a measurement system from specification through commissioning and on going maintenance. Also the concepts of measurement traceability and uncertainty of measur-ureinent are also introduced. This seminar will cover the MSA 3rd edition, and will provide the student with an understanding of how to evaluate the basic sources of measurement error and variation as described in the MSA. The seminar will also include practical examples of how to use these methods.
NCSL International 2005 Workshop and Symposium
Guest Registration
August 6-12, 2005 - Washington, DC
Conference language: English
Conference currency: USD

Register on-line at www.ncsl.org
Fax or Phone Credit Card Registrations to: Fax: 303.440.3384 – Phone: 303.440.3339
Mail Check or Credit Card Registrations to: NCSL International, 2995 Wilderness Place, Suite 107, Boulder, CO 80301-5404

registration Options

Guest Program Dates & Fees
Badges are required at all NCSLI Events.

- Evening Reception Sun Aug. 7 7:00 p.m. - 9:00 p.m. N/C
- Orientation and Continental Breakfast Mon Aug. 8 7:30 a.m. - 8:30 a.m. N/C
- Tour “Welcome to Washington” Mon Aug. 8 9:00 a.m. - 1:00 p.m. $40
- Tour “The Presidents/Embassy Row/Diplomacy” Tue Aug. 9 10:00 a.m. - 2:00 p.m. $45
- Conference Reception & Banquet - Tue Aug. 9 6:00 p.m. - 9:30 p.m. $85
- Tour “Law and Order” Wed Aug. 10 9:00 a.m. - 1:00 p.m. $40
- International Event - Galileo Players Wed Aug. 10 5:30 p.m. - 10:30 p.m. $75

Sunset dinner cruise on the Potomac aboard the “Dandy” riverboat

Lunch tickets to the Workshop and Symposium:
- Lunch Mark Hurwitz, President & CEO, ANSI Mon Aug. 8 12:15 p.m. - 1:45 p.m. $35
- Lunch Member Delegates Meeting Tue Aug. 9 12:15 p.m. - 1:45 p.m. $35
- Lunch Greg Hahn, Comedian Wed Aug. 10 12:15 p.m. - 1:45 p.m. $35
- Lunch John Kitching, NIST Physicist Thur Aug. 11 12:15 p.m. - 1:45 p.m. $35

Registrant Information (Please print or type)

First Name: ___________________________ Host's Name: ___________________________
Last Name: ___________________________ Telephone Number: _____________________
Address: __________________________________ Organization: _______________________
City/State/Zip/Country: __________________________ Dept./Mail Stop: __________________
Telephone Number: __________________________ Address: _______________________
E-mail: __________________________________ City/State/Zip/Country: _______________

Special Accommodations

☐ Please check here if you require special ADA, wheelchair, or dietary needs, and attach a written description so we may serve you.
Please note the only alternate meal option offered at this time is a vegetarian plate.

Credit Card Information

☐ VISA ☐ Mastercard ☐ American Express ☐ Discover Card #: __________________________ Exp. Date: ______ / ______
Signature: __________________________ Date: ______ / ______

Cancellation Policy

Full Guest Program registration fees will be refunded if written notice is received (by fax or mail) by July 11, 2005. You may transfer your paid Guest Program registration to another individual to attend in your place without penalty. WRITTEN AUTHORIZATION FOR THIS SUBSTITUTION IS REQUIRED. Please mail or fax written notice of substitution to the NCSL International business office to arrive by July 29, 2005. NCSLI reserves the right to cancel any of the Guest Program events if the number of registrations is below the contracted minimum with the tour company.

For NCSLI Use Only

Registration Received: ______ / ______ CK # / CC App #: __________________________ CK / CC App Date: ______ / ______
Payment Received: ______ / ______ PO / Inv. #: __________________________ Amount: $__________ Entered: ______ / ______
CONFERENCE TOURS

Join us on Friday, August 12, for a tour of the new NIST Advanced Measurement Laboratory

Tour space is limited, so sign up early! Only registered conference attendees may attend. There are four tours, each of a different aspect of the facility. Choose from Physical, Electrical, Optical/Physics, or the Center for Neutron Research/Nanofabrication Facility. The following is a general description of the facility, and the inside pages contain descriptions of the individual tours. Tour cost is $35.

Advanced Measurement Laboratory

To spy an individual molecule in a throng of millions, to seize it, and to manipulate it. ... To arrange atoms into an ordered nanotechnology landscape of precisely spaced steps and terraces. ... To determine the size of an electrical current by tabulating, one by one, the number of electrons flowing by. ... To gauge distances in increments tinier than the radius of an atom. ... To measure the strength of a chemical bond between an antibody and a virus particle.

These and other extreme capabilities are key to the nation's high-technology future, the competitiveness of its industries, and the health and well-being of its citizens. They are essential for our nation to realize the societal benefits and seize the commercial promise of the nanotechnology discoveries now being made in laboratories around the world. And they are among the goals of more than 100 horizon-stretching research projects to be housed in the newly built Advanced Measurement Laboratory (AML) at the National Institute of Standards and Technology (NIST).

Completed in 2004, the AML has few—if any—equals among the world's research facilities. It offers an unprecedented combination of features designed to virtually eliminate environmental interferences that undermine research at the very tip of the leading edge of measurement science and technology.

Accomplishments at the AML will translate into new high-accuracy measurement technologies, databases on the fundamental properties of "nano-structured" materials, and other essential supporting tools and capabilities. U.S. industry and its university and government partners require these infrastructural technologies if they are to succeed fully in scaling today's feats of molecular science and engineering into nanotechnology products and processes for domestic and international markets.

Practical benefits will flow to diverse industries and areas of need—from environmental protection to homeland security to biotechnology.

Each tour has room for 36 people. The tours will be divided into groups of 12. Each group will see all the stops within that tour, in varying order. One group will visit Tour Stops 1-2-3, another group will visit Stops 2-3-1, and the third group will visit Stops 3-1-2. All tours will be conducted simultaneously, and participants must stay with their selected tour group.

Tour A - Physical/Dimensional

Planned tour stops in this category include state-of-the-art mass, dimensional coordinate measuring machine, and small force measurements.

Stop 1. The Standard Kilogram

This presentation includes a report on the present state of the unit of mass, the limitations, the needs, and the research areas that NIST is undertaking, as well as a brief overview of the possible alternatives being considered for the re-definition of the kilogram. In addition, visitors will tour our new state-of-the-art mass measurement facilities and receive an overview of the mass calibration services, including traceability and uncertainty budgets.

Stop 2. Dimensional Metrology: Ultra-High Accuracy Coordinate

This tour stop will show in operation the NIST-enhanced ultra-high-accuracy Moore 48 Coordinate Measuring Machine. Housed in the subterranean level of the new NIST Advanced Measurement Laboratory in a state-of-the-art temperature controlled environment, the system attains measurement accuracies of tens of nanometers, making it arguably the most accurate instrument of its type in the world.

Stop 3. Small Force Metrology Laboratory

The NIST Small Force Metrology Laboratory is home to the world's only Electrostatic Force Balance, a new high-resolution vacuum weighing instrument for atomic force microscopes and instrumented indentation force calibration.

Tour B - Electrical

Planned tour stops in this category include

Stop 1. Voltage Metrology

The mission of the voltage standard lab at NIST is to maintain the U.S. legal volt and to provide for the dissemination of an internationally consistent, accurate, reproducible, and traceable voltage standard that is tied to the SI units and readily and continuously available for the U.S. scientific and industrial base. It also cooperates with the Quantum Device Group in Boulder to utilize advances in the application of quantum voltage standards.
Stop 2. Resistance Metrology

Resistance standards are used to support a wide variety of impedance, temperature, strain, power and current measurements, over a wide range of frequency, and at very high levels of accuracy. NIST maintains the U.S. legal ohm with the quantum Hall resistance (QHR) and can help U.S. industry to demonstrate and verify in a cost-effective way the accuracy of electrical measurements and the performance of high-precision instrumentation in a competitive world environment.

Stop 3. Power and Energy Metrology

The NIST Power and Energy Laboratory performs calibrations of commercial standard watt, watthour, var, and varhour meters. Virtually all residential revenue metering in the United States is traceable to this laboratory through these standards, which are submitted to NIST by electric power utilities, state public utility commissions, and meter manufacturers. On this tour stop you will see the NIST-developed power bridge used to perform these calibrations and hear about the research NIST is performing in support of the electric power industry.

Tour C - Optical/Physics

Planned tour stops in this category include High Accuracy Cryogenic Radiometry (HACR), Quantum Computing, and Special Irradiance and Radiance Responsivity using Uniform Sources (SIRCUS).

Stop 1. High Accuracy Cryogenic Radiometry

The HACR, the nation’s optical power standard with its intrinsic uncertainty of 0.02%, improves the radiometric accuracy throughout the Division and the nation. The facility currently operates in the 200 nanometers to 1000 nanometers range as well as out in the 10.6 micrometer range.

Stop 2. Spectral Irradiance and Radiance Responsivity using Uniform Sources (SIRCUS)

SIRCUS is a reference calibration facility that transfers detector-based spectral irradiance scales, derived from the high accuracy cryogenic radiometer, to broadband, filtered detector packages, to transfer-standard spectral irradiance detectors, and to instruments that measure spectral radiance. Stabilized, tunable lasers and different sized integrating spheres are used to create a high-intensity monochromatic source with flexible geometry.

Stop 3. First Class Science: Quantum Computing

Quantum information processing holds promise for such applications as high-precision measurement, secure communications, and computation of otherwise intractable problems. Quantum bits, or qubits, must be quantum mechanical objects capable of being in a superposition of two different states. Our approach is to use single atoms, cooled nearly to absolute zero and held in an optical lattice (a periodic optical nanostructure) as the qubits.

Tour D - NIST Center for Neutron Research (NCNR) and Advanced Measurement Laboratory (AML) Nanofabrication Facility

Planned tour stops in this category include dosimetry calibration, materials analysis and two premiere NIST user facilities for neutron research and nanofabrication.

Stop 1. NIST Center for Neutron Research

A recent report by the President’s Office of Science and Technology Policy described the NIST Center for Neutron Research as “the only U.S. facility which currently provides a broad range of world-class capability” in neutron research. Used by more than 1,600 scientists and graduate students each year, this model national user facility provides beams of neutrons (subatomic particles released by the nuclei of atoms) for state-of-the-art scientific research in biotechnology, nanotechnology, chemistry, physics, materials science, and even archaeology and art history.

Stop 2. Nanofabrication Facility

The NIST Nanofabrication Facility is an 8,520 square meter facility incorporating 12 Class 100/ISO 5 clean-room bays. The Nanofabrication Facility will enable fabrication of prototypical nanoscale test structures, measurement instruments, Standard Reference Materials, electronic devices, microelectromechanical systems, and biodevices critical to biotechnology, nanotech-nology, homeland security, semiconductor manufacturing, and other key national needs.
Best Invited Paper

Refactrometry Using a Helium Standard

Speaker: Jack Stone
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National Institute of Standards and Technology
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Editor’s Note: For space considerations, I had to truncate this paper at about 4 published pages. For the full 14-page paper, contact the author at the NIST email, or request a copy in MSWord format from the Editor.

Abstract

The refractive index of helium at atmospheric pressure can be calculated from first principles with a very low uncertainty, on the order of $10^{-10}$. Furthermore, the low refractive index of helium puts minimal demands on the pressure and temperature measurements required to determine the refractive index of a given sample of helium gas. Therefore helium can serve as a practical, theory-based standard of refractive index that might be used in place of air for ultra-high accuracy interferometric length measurements. Because its index of refraction is known, helium can also be used to characterize and correct errors in a gas refractometer.

We have built two refractometers based on a laser locked to the transmission maximum of a Fabry-Perot cavity, and we use helium to measure and correct pressure-induced distortions of the refractometers. We have also characterized other sources of error in our Fabry-Perot refractometers, such as errors associated with the effect of humidity on the mirror coatings. When our two refractometers simultaneously measure the refractive index of a common nitrogen sample, we find that the two systems agree with each other within a few parts in $10^9$. These measurements are sufficiently encouraging that one might speculate on the possibility of developing pressure standards based on refractometry.

1. Introduction

Measuring air refractive index is often the critical, limiting, link in practical realization of the meter via interferometry. Laser wavelengths in vacuum can be measured to high accuracy, but the wavelength in air, which serves as the basic metric for almost all interferometry, requires knowledge of refractive index. Most commonly, refractive index is determined by measuring air pressure, temperature, humidity, and possibly carbon dioxide concentration, and calculating the refractive index using the Edlen[1] or similar equations.

With some care we can routinely determine refractive index in a uniform laboratory environment to 1 part in $10^7$, and with state-of-the-art environmental sensors the expanded ($k = 2$) uncertainty might be reduced to as low as 2 parts in $10^8$. If yet smaller uncertainty is needed, several alternate approaches could be pursued. For example, it may be possible to carry out the measurements in vacuum, or to perform measurements in a helium environment. Helium has two advantages relative to air: (1) the refractive index is known to very high accuracy from ab initio calculations[2] and (2) the molar refractivity of helium is about one eighth that of air, so that for a given uncertainty of pressure and temperature measurement, the refractive index of a helium sample can be determined with one eighth the uncertainty of air refractive index.

When measurement in vacuum or a helium atmosphere is not practical, a final possible route to high-accuracy displacement measurements is to employ a gas refractometer to determine the air refractive index. In this paper we describe a simple refractometer based on a laser locked to the transmission maximum of a Fabry-Perot interferometer (hereafter designated FPI) of nominally fixed length. Changes in laser frequency track changes in refractive index as the interior of the FPI cavity is filled with gas or pumped out to vacuum. For an ideal cavity, the change in laser frequency is proportional to the change in refractivity going from the evacuated to the filled state. (Refractivity is $n-1$, where $n$ is the refractive index.) Since the evacuated state has a known refractive index $n = 1$, measuring the change in refractive index also tells us the absolute refractive index of the gas.

A practical problem in implementing this scheme is the difficulty in accounting for distortions of cavity dimensions caused by the changing pressure. Our method of overcoming this problem is to employ helium gas at atmospheric pressure as a known reference, because the refractive index of helium can be accurately calculated from first principles. Since the refractive index of helium is known, we can predict the change in laser frequency when the cavity is filled from vacuum to some helium pressure. Any deviation from this prediction provides a measure of cavity distortion, allowing us to "error map" the refractometer as a function of pressure. It is still necessary to accurately measure helium pressure and temperature in order to carry out this error correction procedure, but the low refractive index of helium puts minimal demands on the required accuracy of the sensors. Also, the high-accuracy sensors do not need to be a permanent part of the apparatus, since the error is not expected to change with time.

2. Refractive index of helium.

In outline, the refractive index of helium can be calculated as described in this section. For more background information, see Stone and Stejskal [2].

The refractivity of helium, $n-1$, is very nearly proportional to the molar density of the gas sample and to the molar polarizability of helium AR, that is, $n - 1 \propto \rho A_{AR}$. The proportionality is not exact in dense gasses. Departures from linearity are taken into account in the Lorentz-Lorenz equation:

$$\frac{(n^2 - 1)}{(n^2 + 2)} = A_0 \rho + B_0 \rho^2 + ...$$

(1)
where \( B_R \), the second refractivity virial coefficient, accounts for two-body interactions. Equation (1) allows us to calculate the refractive index if the molar density is known. The molar density as a function of pressure and temperature can be determined from the expressions

\[
\rho = P / (Z N_A k T) \tag{2}
\]

\[
Z = 1 + B(T) \rho + C(T) \rho^2 + \ldots \tag{3}
\]

where \( P \) is pressure, \( T \) is absolute temperature, \( k \) is the Boltzmann constant, \( N_A \) is the Avogadro constant, \( Z \) is the compressibility factor for a non-ideal gas, and \( B(T) \) and \( C(T) \) are virial coefficients for the compressibility expansion. All of the parameters needed to make this calculation are known quite accurately. In particular:

(a) \( A_R \) is known from \textit{ab initio} calculations of the atomic polarizability, which are believed to be extremely accurate. As described in reference [2], it is possible to combine calculations of the static polarizability of Lach et al [3] with dynamic polarizability as calculated by Bhatia and Drachman [4], to achieve a value whose uncertainty is probably limited primarily by the lack of QED corrections to the dynamic terms. As a function of wavelength, the molar polarizability is then given by

\[
A_R = 0.51725407 \times \frac{1197.5410}{\lambda^2} + \frac{3.290677 \times 10^6}{\lambda^4} + \frac{9.800874 \times 10^9}{\lambda^6} \tag{4}
\]

where \( A_R \) is expressed in units of cm\(^3\)/mol. The estimated relative uncertainty of this expression is 1x 10\(^{-6}\) at optical frequencies. At \( \lambda = 633 \) nm, equation (4) yields \( A_R = 0.5202634(5) \) cm\(^3\)/mol.

(b) \( B_R \) has only a small effect on the calculation and is known sufficiently well from a number of studies, as summarized in a recent article by Koch et al [5]. Based on these studies we estimate

\[
B_R = -0.032 - 0.00017 T \tag{5}
\]

where \( B_R \) is expressed in units of cm\(^6\)/mol\(^2\), the temperature \( T \) is between 273 K and 323 K, and the wavelength is in the vicinity of 633 nm.

(c) The virial coefficient \( B(T) \) is well known from the calculations of Hurly and Moldover [6]. Over the range 275K to 325K, their results can be approximated as

\[
B(T) = 13.028 - 0.00417 T \tag{6}
\]

where \( B(T) \) is expressed in cm\(^3\)/mol. \( C(T) \) is sufficiently small that it has no noticeable effect on the calculations.

This provides everything needed to calculate the refractive index. The calculated refractive index for 633.0 nm radiation, at 101 325 Pa pressure and 20 °C, is 1.00 032 426 00(8), where the standard uncertainty (8x 10\(^{-11}\)) arises primarily from uncertainty in the Boltzmann constant.

At 632.991 nm wavelength (the approximate vacuum wavelength of a helium neon laser), for pressures less than 110 kPa and temperatures between 273 K and 323 K, we find empirically that a good approximation to the calculation described above is

\[
1 + (9.38598 \times 10^{-8} (P/T) - 1.333 \times 10^{-13} (P/T)^2) \times (0.999957 + 1.5 \times 10^{-7} T) \tag{7}
\]

where \( P \) is in Pascal and \( T \) is in Kelvin. The error in this approximation relative to the more exact procedure is nearly negligible (less than 4x 10\(^{-11}\)) over the stated range.

3. Fabry-Perot Refractometer

Several people have developed refractometers based on a Fabry-Perot cavity [7-13]. Our Fabry-Perot refractometer is conceptually as shown in Figure 1. A laser shines through a high-finesse Fabry-Perot cavity. The cavity, as shown in Figure 2, is made from a zerodur [14] rod that has a channel sawed through the center and mirrors optically contacted to the ends. The open side of the cavity assures that the gas inside the cavity is in good equilibrium with gas in the surrounding area. Thus, if it were placed right next to the measurement path in an interferometer, we could expect that the refractive index inside the refractometer would closely match the refractive index in the measurement path. The mirror radii are large relative to the length of the cavity but sufficiently small so that they require only minimal parallelism of the polished ends of the rod. The cavity is consequently easy to construct. More details of the cavity can be found in reference [15].

A laser is locked to a transmission maximum of the cavity using a simple dither of laser frequency, phase sensitive detection of the transmission maximum with a lock-in amplifier, and an integrating feedback loop to control laser frequency and wavelength. In this manner the laser remains locked to the center of the transmission maximum,
maintaining constant wavelength even as the refractive index within
the cavity changes (under the assumption that the cavity length
remains constant). To maintain constant wavelength with changing
refractive index, the servo system must readjust the laser frequency,
and the change in laser frequency is proportional to the change in
refractive index (n-1).

In order to determine the frequency of the wavelength-stabilized
laser, the output is mixed with the output of a second, fixed-frequency
laser; the resulting beat frequency, measured with a frequency
counter, is the difference between the unknown frequency of the
wavelength-stabilized laser and the known fixed frequency of the
second laser. We are using an iodine-stabilized laser as the fixed-
frequency source.

We actually have two independent refractometers, where both are
housed in a common environment chamber that can be pumped to
vacuum. A gas laser with PZT length control is locked to a 453-mm
long FPI cavity and a tunable diode laser is locked to a 94 mm cavity,
about 1/5 the length of the long cavity.

The basic resonance condition for a Fabry-Perot cavity is that the
round-trip phase shift be an integral multiple of 2π. This phase shift
consists of several parts. In first approximation the shift is 2π (2L/λ
) where 2L is the round-trip length through the cavity. To this must
be added phase shifts ϕ_m1 and ϕ_m2 for reflection at the two end
mirrors and a phase shift ϕ_G that occurs because the light within the
cavity is not a plane wave. (This is the Guoy phase shift with an
appropriate sign convention.) Thus the resonance condition is

\[ 2\pi n = (4\pi L/\lambda) + \phi_{m1} + \phi_{m2} + \phi_G \]  

(8)

where \( m \) is some integer. The three phase shifts \( \phi_{m1}, \phi_{m2}, \) and
ϕ_G represent only a very small part of the total phase shift and are
nearly constant. If they are ignored, and if we make the substitution
\( \lambda = c/(nf) \) where f is the laser frequency, c is the speed of light in
vacuum, and n is refractive index, then the resonance condition takes
on the familiar form

\[ f = mc(2nl) \]  

(9)

When a gas is admitted to the cavity and the frequency of the
locked laser changes from some initial value \( f_i \) to the final value \( f_f \),
equation (9) implies that the final refractive index is given by

\[ n - 1 = \frac{f_i - f_f + \Delta m(c/2L)}{f_f} \]  

(10)

Here \( \Delta m \) is the change in order number, which can be determined
by using two cavities in a vernier-type arrangement [15].
Alternatively, \( \Delta m \) might be determined by measuring pressure and
temperature in the cavity and determining \( n \) with modest accuracy,
sufficient to resolve any ambiguity in \( \Delta m \), and then using equation
(10) to improve the accuracy of \( n \).

We define \( F \) as the numerator in equation (10),

\[ F = f_i - f_f + \Delta m(c/2L) \]  

(11)

\( F \) can be thought of as the total change in frequency of the laser,
where the term \( \Delta m(c/2L) \) includes the effect of mode hops. Note
that \( f_i \) differs from \( f_f \) by no more than the free spectral range (fsr)
of the cavity, because beyond this point the laser will mode hop,
locking to the next order \( m \). Therefore the term \( f_i - f_f \) contributes
much less to \( F \) than does the term \( \Delta m(c/2L) \), where \( m \) may be as
large as 400. It is usually assumed that \( \text{fsr} = c/2L \) and thus measure-
ment of the free spectral range provides the needed information to
evaluate \( F \). However, the dependence of the mirror phase shifts
\( \phi_{m1} \) and \( \phi_{m2} \) on frequency complicates matters. The dependence
of phase shift on frequency has very little bearing on equation (10),
but the shift in \( \phi_m \) has a significant influence on the measurement
of free spectral range. The fsr is the difference in frequency of two
lasers locked to adjacent longitudinal modes of the cavity. The dif-
ference in phase shift between the two modes causes a small error
in determination of \( c/2L \) which is multiplied by a fairly large number
(\( \Delta m \)) in equation (10). The resulting error in refractive index is
small (less than 10^{-9} for our 453 mm long cavity) but not negligible
in some applications.

Equation (10) is of limited accuracy because it assumes that the
length of the cavity is constant, whereas in reality the length
changes in response to pressure.

If the cavity changes length from \( l_i \) to \( l_f \), then the equation must be
modified to read

\[ n - 1 = \frac{f_i - f_f + \Delta m(\text{fsr})}{f_f} + \left( \frac{l_i - l_f}{f_f} \right) \]  

(12)

The expected change in length is on the order of \( \Delta l/l = 6x10^7 \),
large enough that it is necessary to carefully account for the effect.
The compression is a function of the bulk modulus B of the material
and of the change in pressure \( \Delta P \):

\[ \Delta l/l = (1/3)B\Delta P \]  

(13)

The bulk modulus depends on Young's modulus (Y) and Poisson's
ratio (\( \nu \)). It can also be written as a function of \( Y \) and of the shear
modulus \( \mu \):

\[ B = \frac{Y}{3(1-2\nu)} = \frac{Y}{3(3-2Y/\mu)} \]  

(14)

It is our understanding that the bulk modulus is determined by the
manufacturer from measurements of shear modulus and Young's
modulus. If we assume that \( \mu \) and \( Y \) are uncertain by 1\%, these
uncertainties will both contribute uncertainties of about 5\% in B.
Combining the two uncertainties using root-sum-squares, the uncer-
tainty in C could then be as large as 7\%, which will give rise to an
unacceptably large uncertainty of 4x10^{-8} in the refractive index.
Furthermore, for a cavity such as ours, where the mirrors have fused
silica substrates and the body of the resonator is zerodur, the dissim-
ilar materials cause complicated pressure-dependent changes that
are not easily predicted from first principles[15].

As already mentioned, we can avoid this problem by calibrating
with helium. Since the refractive index of helium is well known,
equation (12) can be used to calculate the change in length of the
cavity (more precisely, to determine any possible pressure-induced
errors in the system), and this knowledge can be used to correct
subsequent measurements. It is important that the helium have
good purity. We use helium that has less than 1 part in 10^{-6} contami-
nants. The contaminants most likely to be present will shift the
refractive index by several parts in 10^{10}. 

Best Conference Paper 2004
4. Testing the refractometer pressure response

We have studied various aspects of the behavior of our FPI refractometer. To begin with, we used He gas to measure the distortions $\Delta l/l$ as a function of pressure. Results for our long cavity are shown in Figure 3. The dashed line shows a prediction based on the manufacturer's published values of the Young's modulus (90.3 GPa) and Poisson's ratio ($\nu = 0.243$). The deviation of experiment from the prediction amounts to an error of $2.8 \times 10^{-8}$ at atmospheric pressure. However, this deviation does not necessarily arise from imprecise values of $Y$ and $\nu$. One might imagine that additional distortions occur at the ends of the cavity as a consequence of several possible effects. This is particularly true for our cavity because of the dissimilar materials (zerodur and fused silica) used in construction, and in fact we have seen some evidence suggesting that the dissimilar materials are a source of distortion [15]. Such effects will be more important in a short cavity than in a long one, and consequently a good way to check for end-effects is to compare results from two cavities of greatly different length. Note that equation (9) implies that fractional changes in frequency $df/f$ are given by

$$\frac{df}{f} = -\frac{dn}{n} - \frac{dl}{l}$$

(15)

In the absence of end distortion, $dl/l$ should be independent of cavity length. Thus, if two cavities of different length share the same environment (the same $dn/n$), and in the approximation that the lasers locked to the two cavities have nearly the same frequency $f$, the change in frequency $df$ should be essentially identical for the two cavities. For larger changes in frequency, with $df$ replaced by $\Delta F$ (that is, the frequency change is corrected for mode hops) it is again true that the change $\Delta F$ for a laser locked to a short cavity should be essentially the same as $\Delta F$ for a laser locked to a long cavity. If we look at $F_{\text{Short}} - F_{\text{Long}}$, the difference frequency between the lasers locked to our long and short cavities (the intercavity beat frequency), we would expect that the beat frequency should remain constant as helium is admitted to the cavity. Any variations in the beat (after correction for mode hops) is a very sensitive test of end-effects.

Figure 4 shows the result of this test using our two cavities. There is a variation of about 14 MHz in the beat frequency as the cavity is filled with helium to atmospheric pressure. 14 MHz represents a discrepancy of 3 parts in $10^8$ of the laser frequency. We might attribute this discrepancy to end distortions. These distortions are probably very similar in our long and short cavities, which are identical except for length. However, identical distortions will have about 5 times greater effect on the frequency of our short cavity than on the frequency of the long cavity. Therefore, most of the 14 MHz discrepancy might be attributed to end effects in the short cavity, and end effects in the long cavity are about 1/5 as large. More precisely, under the assumption that both cavities have the same end effects, then the 14 MHz discrepancy arises from a 17.5 MHz effect in the short cavity and 3.5 MHz effect (i.e., 17.5 MHz/5) in the long cavity. Expressed as a fractional frequency shift, the 3.5 MHz error is $7 \times 10^{-9}$. End effects thus account for a relatively small portion of the discrepancy shown in Figure 3, with the predominant part of the discrepancy presumably arising from uncertainties in the material properties.

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INDUSTRY MEETINGS
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CONTACT: Steve Sidney, stevs@nla.org.za
Maggie Rossouw, maggier@nla.org.za
Website: www.nla.org.za

September 17-22, 2006
IMEKO XVIII World Congress
Rio de Janeiro, Brazil
CONTACT: Karolina Havilla, Secretariat
P.O. Box 457, H-1371
Budapest, Hungary
website: <www.imeko.org>

November 14-16, 2006
3rd International Conference on Metrology - Trends and Applications in Calibration and Testing Laboratories
Tel Aviv, Israel
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ISAS International Seminars
P.O. Box 34001
Jerusalem, 91340 Israel
e-mail: <congress@isas.co.il>
website: <www.isas.co.il>

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<www.ncsli.org/events/>

You can submit information on your upcoming Region/Section meeting, Committee meeting, or other Metrology-related event on the web! Just click on “Calendar” then “Submit an upcoming event”. Get listed and increase awareness and attendance!
Charlie was born, raised and educated in Hoboken, NJ. He then attended New York University and received his BSEE in 1934. In 1955, he received his MSEE from the University of Connecticut.

He was Managing Editor of Telecommunications Magazine at his retirement in 1988. Charlie's work history resume reads like a Who's-Who of Boston industry. He edited the General Radio Experimenter, was at Avco Missile Systems for his NCSLI period, and prior to that, at the U.S. Navy Medical Research Laboratory, Electric Boat Division of General Dynamics, Radio Corporation of America and his first job at Western Union Telegraph Co.

He was member of several Professional organizations over his career. He was a founding member of the National Conference of Standards Laboratories, where he served as president from 1966 - 1968. He was Adjunct Professor at George Washington University from 1962 - 1968, a Fellow of the Institute of Electrical and Electronic Engineers, the International Scientific Radio Union and National Society of Professional Engineers.

He also received several Honors and Awards including Letter of Commendation for Outstanding Services as a Civilian Engineer for the U.S. Navy in 1946, as well as Outstanding Achievement in Metrology and Calibration from the U.S. Air Force Systems Command in 1964 among several other distinguished awards.

He also was very active in Community Services. Charlie's daughter, Barbara Kelly, remembered that her dad delighted in the recognition we gave him during our 40th anniversary year in 2001 where our commemorative newsletter noted his NCSLI Newsletter service back in the 1960s.

He is survived by two children.
BIPM REPORT
Andrew Wallard

BIPM was originally created to be a scientific institution with responsibility for the coherence and consistency of the world measurement system, traceable to the International System of Units (SI).

Initially this focused strongly on length and mass but, over the first 30 or so years of its life, BIPM's technical work grew steadily to cover temperature, electricity and photometry. Ionizing radiation and time characterization came much later and an activity in chemical metrology has been with us for only about five years.

The scientific programme is ever-changing with large areas disappearing as BIPM's job is done, but being replaced by new projects designed to meet the needs of today's metrology community. BIPM is accustomed to change---something which makes it a lively and interesting place in which to work as well as keeping us on our scientific toes. Scientific work is at the heart of what we do, and gives us a technical credibility, but it is far from all we do.

Progressively, the four-yearly General Conferences on Weights and Measures have recognised the need to respond to the metrological needs in new areas through Joint Committees or through working groups of existing Consultative Committees. The CIPM MRA is a major activity for us as well as for NMIs and others from the world-wide metrology community. This coordinating work of the BIPM, which we are told is much appreciated by Member States, is stretching BIPM's resources to the limit and is in danger of diverting effort away from some of the high-priority technical projects voted for by the last General Conference.

The next few years will be critical for us as we balance our limited resources against a large and expanding work programme. We also must soon start to prepare reports and position papers for the CIPM on our next work plan and budget proposals for the 23rd CGPM in 2007. The CIPM Secretary, Robert Kaarls, will be updating the review he made for the last CGPM and I have no doubt that we shall again be faced with high-priority demands which out-strip our current resources.

A review of recent events

2004 saw an increase in the activities of the BIPM in scientific terms as well as the number of meetings of Consultative Committees, Joint Committees and Workshops. This growth, fuelled substantially by the expanding work of the CIPM MRA and our collaborations with other international and intergovernmental bodies, is consistent with the orientations for our work discussed by the 22nd General Conference of Weights and Measures.

We are especially pleased by the progress in laboratory medicine under the Joint Committee for Traceability in Laboratory Medicine, the JCTLM. This programme is now well on the way to creating a widely acknowledged and internationally accepted framework for the recognition of reference materials "of a higher order" as required by the In Vitro Diagnostic community and to identifying best practice in the validation of measurement methods by competent laboratories. We were very grateful for the offer from the International Federation of Clinical Chemistry to share the costs of the JCTLM Secretariat at the BIPM and look forward to further developments in partnership with them and the third partner in JCTLM, the ILAC.

BIPM's collaboration with the accreditation community continues to develop positively. ILAC and BIPM share a common interest in, and responsibility for, the world measurement system - essentially a combination of:

- equivalent national standards, demonstrably traceable to the SI through their realization and maintenance at the NMI level and validated through the CIPM MRA; and
- effective national traceability and measurement systems in which measurements are traceable to these national standards, at whatever level of accuracy is appropriate to the user. This traceability is generally achieved through a network of technically competent calibration and testing laboratories accredited to ISO/IEC 17025 by a National Accreditation Body (NAB) which is a signatory to the ILAC Arrangement.

The CIPM MRA and the ILAC Arrangement are complementary and mutually supportive and their unique combination helps to provide confidence in the equivalence of SI traceable measurements worldwide. This infrastructure is increasingly recognized as providing the technical basis for consistency of measurements and their acceptance in international trade and its use can help reduce or eliminate Technical Barriers to Trade. These points were made strongly in a presentation to a workshop held by the World Trade Organization's Committee on technical barriers to trade last June.

The Joint Committee for the Regional Metrology Organisations (RMOs) and the BIPM (the JCRB) met in May and in October 2004. At its second meeting it also held a special workshop on quality system assessment processes in the RMOs at the same time as a meeting of the Directors of NMIs from Member States of the Metre Convention and Associates of the CGPM. The JCRB has focussed on arrangements for the end of the transition period of the CIPM MRA and, in particular, the necessity for signatories to the CIPM MRA to have their quality systems fully reviewed and in place by the first JCRB of 2005.

This timescale has put pressure on the RMOs and the NMIs concerned to complete this process before the deadline so as to ensure their Calibration and Measurement Capabilities (CMCs) are not removed from the Key Comparison Data Base. The workshop helped considerably in the mutual understanding of the way in which each RMO reviewed the quality systems at their member laboratories and also endorsed the BIPM's own quality system, which was presented during the workshop. The Directors' meeting dealt largely with matters which concerned the CIPM MRA and several extremely useful presentations were made about NMI experiences, the importance of the CIPM MRA to the Regulators and the way in which the Metre Convention worked on behalf of the
NMI s with ILAC and ISO. The meeting concluded with a presentation by the Secretary - General of ISO, Alan Bryden.

The JCRB and Directors' meetings also endorsed the importance of a joint statement by BIPM and ILAC on the roles and responsibilities of NMI s and National Accreditation Bodies (NABs). Although the concept of accreditation initially grew from within the NMI community, various organisational and other changes may have created a separation which could lead to less collaboration and exchange of the information than is necessary to ensure an integrated approach to national metrology systems. The BIPM and ILAC are, therefore, currently developing a joint statement on the roles of NMI s and NABs and will be presenting it to the first ever meeting of RMOs and Regional Accreditation Bodies at the BIPM in March 2005. BIPM will also be working with ILAC and the OIML on a statement on the use of their various Mutual Recognition Arrangements or, in the case of OIML, their Mutual Acceptance Arrangement. This statement, requested by the 22nd CGPM, will urge Governments and other relevant parties to use recognised MRAs as the technical basis for trade and other agreements or treaties.

Within the BIPM we have seen the successful implementation of our own self-declared/peer-reviewed quality system. Progressively, other aspects of BIPM's work will be brought within either an ISO/IEC17025 system or a system based on ISO 9001.

BIPM's Photometry and Radiometry group finally closed its doors in the summer after some 70 years of activity at the BIPM. The previous members of this team are now working with colleagues in the Electricity Section to start up new projects on the watt balance and the calculable capacitor in collaboration with our Australian and Canadian colleagues.

There have been substantial successes in other Sections. In ionizing radiation, a large number of comparison reports have been published despite a heavy programme of comparisons and the updating of the SIR electronics, the replacement of the medium energy X-ray tube and improvements in the mountings for the cobalt source. The Mass section has measured some of the silicon spheres as part of the international Avogadro project and have been a number of important publications about the FB2 balance, and on air density. With others in the Chemistry section and in a number of NMIs, they produced one of the BIPM's most highly cited papers on the composition of air.

The Length group published another of the year's most important papers on the performance of frequency combs in Science magazine, and the Time group has revised and automated the production and dissemination of TAI and UTC. They have also tackled the difficult subject of uncertainty in UTC and have maintained a successful series of comparisons of GPS receivers. The Database and IT teams have improved the KCDB, have published a newsletter and have earned themselves well-deserved compliments from all over the world.

In Publications, the web continues to be our major publicity vehicle. The team has developed it and is planning several innovations during 2005 as well as a number of major publications and reports of key conferences and meetings. Metrologia continues to attract new subscribers under our partnership with the Institute of Physics.

On a personal front, I have spent a considerable amount of time during my first year as Director representing the BIPM externally, in particular attending three General Assemblies of the RMOs. BIPM's first links are with the NMI s and the RMOs and without them it clearly would be impossible to achieve our mission of world-wide consistency of measurement. I welcomed the chance to report on our work to the General Assemblies, and to make high-level contacts on behalf of Metre Convention Members and Associates.

The CIPM held its usual meeting in October and, this year, focussed on our links with ILAC and OIML as well as dealing with a number of important issues which concern the long-term planning of BIPM's scientific and technical work. It also considered a proposal from the materials community for an activity, within the Metre Convention, on traceability and uncertainty in materials metrology. The CIPM launched a number of studies and reviews which will help it formulate a response to this proposal at its next meeting. CIPM also reviewed the near-to-final draft of the 8th SI brochure and commented on the supplements to the GUM and the next edition of the VIM. We expect publication of all three documents during 2005. At the CIPM we welcomed Professor Ernst Göbel in his new role as President as well as three new members, Dr Luc Erard (BNM, France), Dr Kim Carneiro (DFM, Denmark) and Dr Hratch Senerjian (NIST, USA).

During 2004 we were pleased to welcome Costa Rica, Jamaica and Vietnam as Associates of the CGPM and all have now signed the CIPM MRA, so bringing the number of institutes and designated organisations committed to the CIPM MRA to nearly 150. 2004 has also been a year in which several NMIs have seen turbulent times, mergers and, in the case of Australia, the creation of a new NMI from two existing organisations. Similar events are taking place in Italy and France as their national structures change.

The report of the Director for 2004, which contains a more detailed review of our technical and other activities, can be found on the BIPM web site, <www.bipm.org>.

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ILAC/NACLA REPORT

Anthony Anderson

International Laboratory Accreditation Cooperation (ILAC) Laboratory Committee (LC)

I attended last October's ILAC 2004 in Cape Town, South Africa. The LC met during the conference for its fall meeting. The main issue on the agenda for the LC was the situation regarding a statement on accreditation, calibration and test certificates about meeting the principles of ISO 9001:2000. The LC had been requested by the chair of the ILAC Accreditation Policy Committee (APC) to develop language for inclusion on certificates and present it to the General Assembly in Cape Town. The resolution prepared for the GA was as follows:

It is resolved by the ILAC LC that the words,

"This laboratory operates a management system that meets the principles of ISO 9001:2000"

be included on the certificate of accreditation issued by a laboratory's accrediting body and that the laboratory be permitted to use this statement on its own testing and calibration certificates.

20
The ILAC General Assembly endorsed the LC resolution for the current chair of the committee to serve for another two years and represent the laboratory community on the ILAC Executive Committee.

The final results of the LC-sponsored survey on the implementation of ISO/IEC 17025:1999 were presented to the General Assembly. Fifty-three economies participated. The largest response came from chemical laboratories. There was no real difference between technical disciplines in the way the laboratories responded. Measurement uncertainty remains a significant issue for the laboratories. Of the eight sources offered, ABs were considered the best source of information on accreditation and government sources as being the worst.

Training is still needed on measurement uncertainty, traceability and method validation (especially for chemical laboratories). The laboratories did not express displeasure with the conversion from Guide 25 to ISO 17025 and were pleased with the investment return of accreditation on their laboratory. Proficiency testing availability was satisfactory and PT is valued by the laboratories.

In Cape Town, the General Assembly adopted the new ILAC Business and Strategic Plan. The plan restructures some of the committees to carry out the ILAC goals and objectives. The old Accreditation Policy Committee (APC) becomes the Arrangement Committee (ARC) and is responsible for harmonized implementation and continual improvement of the ILAC Arrangement. The Technical Accreditation Issues Committee (TAIC) becomes the Accreditation Committee (ACC) and is responsible for harmonization and improvement of accreditation practise at the international level. The Public Affairs Committee (PAC) becomes the new Marketing & Communications Committee (MCC) and is responsible for internal and external marketing and communication issues. The LC remains unchanged but now the organizational chart allows for more stakeholder advisory committees from other groups other than laboratories.

Two more AB’s have become signatories to the ILAC Arrangement, the Hellenic Accreditation Council (ESYD) for testing and calibration, and the Romanian Accreditation Association (RENAR) for testing. This brings the total to 45 signatories. In other membership categories, there were four new AB’s granted Associate status, including the Assured Calibration & Laboratory Accreditation Select Services (ACLASS) in the United States.

National Cooperation for Laboratory Accreditation (NACLA)

I attended the NACLA Board meeting in Clearwater, Florida November 2 & 3, 2004 and have participated in three Executive Committee conference calls in the last quarter.

I am pleased to report that the Laboratory Accreditation Bureau (LAB) has attained NACLA recognition. They become the seventh AB to be recognized and a signatory to the NACLA MRA.

The MRA continues to be an extensively-debated issue within NACLA and unfortunately one AB has decided that they can no longer be a signatory. I regret to report that the American Association for Laboratory Accreditation (A2LA), has withdrawn from the MRA, but remains a member of NACLA and will continue to participate in the organization. For a copy of the letter from A2LA sent to the NACLA Board contact Tony.

On the subject of the MRA, following a report from the task group looking at the pros and cons of the MRA, the Board voted that the decision made in July 2002 at the San Diego Board Meeting, to maintain the MRA as a requirement for NACLA recognition, be re-endorsed. The language of the MRA will be reviewed by a task force of the Recognition Committee, which includes representatives of signatory and applicant ABs, and some ABs currently opposed to the MRA.

One focus of the task force should be clarification of the meaning of "promote." Discussions within the Executive endorse the opinion that review does not mean change the MRA, and the most likely outcome will be some explanatory words added in italics to clarify some of the language. NACLA has no wish to be at odds with the other internationally recognized MRA’s, but recognizes that the United States has a more complex market situation than markets where there is only one recognized AB.

In November NACLA contracted with Fred Grunder, formerly with the American Industrial Hygiene Association, (AIHA) and a Past President of NACLA, to fill the newly-created staff position of Evaluation Coordinator. The Evaluation Coordinator has the primary responsibility for the ongoing monitoring of the evaluations of laboratory accreditation bodies that apply for NACLA recognition. When needs dictate, the Coordinator is also in a position to become the leader of a given evaluation team.

On January 1, 2005, Bill Tilstone of the National Forensic Science Technology Center became President of NACLA, taking over from Lou Dixon. There are several other new faces this year on the Board along with those returning for another year.

Accreditation Bodies Recognized by NACLA

As of January 1, 2005, there are six accreditation bodies (ABs) recognized by NACLA. They are: the American Industrial Hygiene Association (AIHA); the Forensic Quality Services - International; the International Accreditation Service (IAS, formerly ICBO ES); the Laboratory Accreditation Bureau, LLC (L-A-B); the National Voluntary Laboratory Accreditation Program (NVLAP); and the Performance Review Institute (PRI-Nadcap).

The basis for NACLA recognition is a three-step process: careful review of the ABs documents and procedures; a thorough on-site evaluation by a team of NACLA experts to determine the AB’s compliance with NACLA recognition procedures and the international standard for ABs (ISO/IEC Guide 58); and review of the evaluation team’s report and recommendation by representatives of peer ABs and interested NACLA-member specifiers who form NACLA’s Acceptance Panel.

Those ABs which the Acceptance Panel finds to be competent are invited to become signatories of the NACLA mutual recognition arrangement (MRA). Under the MRA, each AB is required to treat
the accreditations, test reports and certificates of the other signatories as technically equivalent.

Information about the recognized ABs follows:

**AIHA**  
Fairfax, VA 22031-4320  
<www.aiha.org>

**Forensic Quality Services - International**  
Largo, FL 33773  
<www.fqsi.org>

**International Accreditation Service (IAS)**  
Whittier, CA 90601  
<www.iasonline.org>

**Laboratory Accreditation Bureau, LLC (L-A-B)**  
New Haven, IN 46774  
<www.l-a-b.com>

**NVLAP**  
Gaithersburg, MD 20899-2140  
<www.nist.gov/nvlap>

**Scope of Recognition**  
PRI-Nadcap  
Warrendale, PA 15086  
<www.pri-network.org>

*Editor’s Note: A list of the ABs’ accredited laboratories along with other important information will be found on each AB’s web site.*

See page 51 for a note about A2LA/L-A-B recognition.

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**EUROPEAN COOPERATION IN METROLOGY (EUROMET)**  
*Seton Bennett*

**New Member**

Cyprus has become EUROMET’s newest member. The Memorandum of Understanding was signed on 2 February, 2005, by Georgios Tsiartzis, Head of the Weights and Measures Service, on behalf of the Ministry of Commerce, Industry and Tourism.

**iMERA to kick off in April**

The iMERA project (see EUROMET report in the January Newsletter) will be launched at a meeting attended by all the 20 partners at the National Physical Laboratory on April 12. Project Manager Andy Henson says that “this will be the first time all the partners have met together. This launch meeting will be an opportunity to clarify objectives and set a number of tasks in progress. iMERA will set the scene for the future of metrology in Europe.”

**EUROMET General Assembly**

This year’s General Assembly will take place at the Riviera Holiday Club, near Varna, Bulgaria, from 25th to 27th May, 2005. As well as elections of several new Technical Committee chairmen and an update on iMERA, the Assembly will discuss progress with the CIPM Mutual Recognition Arrangement and hear news of links with other organisations.

*Yeah, this metrology organizing is pretty tough work. at places like the Riviera Holiday Hotel. You know I am just kidding. Travel and hard work is the order of the day at these kinds of technical conferences.*
Chris Grachanen

Welcome to the first of an ongoing series of articles devoted to highlighting academic institutions, training programs and other topics/issues pertinent to Metrology education and training. Advancing measurement technologies enable Metrology practitioners to verify diminishing measurement uncertainties with ever increasing instrument sophistication. However, capable Metrology professionals are in short supply these days due in part to one of the traditional sources for developing new talent in the U.S., the U.S. Armed Services, drastically curtailing their Metrology education programs. It is the goal of this series to increase reader awareness of programs, issues and opportunities pertinent to Metrology education and training.

Training Opportunities at NCSLI 2005 Conference

Attending a NCSLI conference is always an opportunity to learn about the latest in measurement technologies as well as being able to take advantage of a friendly environment for face-to-face discussions with measurement experts. In addition, NCSLI conferences offer opportunities for classroom-type tutorial training. The 2005 conference tutorial offerings are exceptionally rich in both content and scope. Dr. Klaus Jaeger, NCSLI's Tutorial Program Chairman, has done a truly remarkable job soliciting and coordinating Metrology experts from all over the world to share their knowledge and expertise at this year's tutorials.

From Fundamentals of Temperature Calibration to Advanced Topics in Uncertainty Analysis there is a veritable cornucopia of subject matter to appeal to a wide audience of Metrology professionals at every stage in their career. Of particular abundance are tutorials in uncertainty analysis and the calibration and use of measurement instrumentation. For those individuals focusing on the business of running a Metrology facility there are tutorials ranging from business software to customer satisfaction, laboratory accreditation to laboratory environment. Tutorials are conveniently scheduled before and after the 2005 conference so as not to conflict with conference presentations.


Detailed information about each of the tutorials being offered may be viewed at <http://www.ncsli.org/conference/2005/tutorials.cfm>.

NCSLI Education and Training Agenda

Realizing the need to be proactive in nurturing the next generation of Metrology professionals as well as promoting existing education/training opportunities, Georgia Harris, NCSLI V.P. of Education and Training, conducted two Metrology education and training fact finding workshops (at MSC 2005 and February 2005 NCSLI Board of Directors meeting). These activities focused on topics beneficial to developing an NCSLI Metrology education and training roadmap for the future. 'Attagirls / Attaboy's go out to Georgia and workshop participants for their enthusiasm and efforts in helping NCSLI determine where to focus valuable resources for promoting and enabling tomorrow's Metrology professionals.

NCSLI's 2005 Training & Education workshop notes as well as a listing of NCSLI's training resources available for checkout, a comprehensive inventory of educational institutions offering Metrology programs and a training information directory may be viewed at <http://www.ncsli.org/training/index.cfm>. Online discussions about Metrology training and education are available at <http://www.ncsli.org/forum/>. Also don't forget to check out courses being offered at NCSLI's Training Center located in picturesque Boulder, CO at <http://www.ncsli.org/training/training_center.cfm>.

The Metrology Job Description Initiative

NCSLI, in partnership with the American Society for Quality (ASQ) Measurement Quality Division (MQD), is focusing efforts on creating accurate job descriptions for Calibration Technicians, Calibration Engineers and Metrologists for the U.S. Department of Labor, Bureau of Labor Statistics. In 2005, the U.S. Department of Labor, Bureau of Labor Statistics will be soliciting input for updates and additions to the Standard Occupational Classification (SOC) listing for the next formal release. The SOC system is used by all Federal statistical agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data. The SOC is updated every ten years.

The SOC's current job descriptions for calibration practitioners are grossly inadequate. Educators use the SOC to provide students with career guidance information. Without adequate job descriptions, prospective candidates may not be steered into the Metrology field by educators. In addition, demographic information such as how many folks are in the Metrology profession, how many folks are leaving the profession, etc., cannot be accurately determined. To these efforts ASQ's MQD has contracted with Professional Examination Services (PES) to coordinate / administer the Metrology Job Description initiative. The following individuals have volunteered for a core team to oversee the initiative:

Jay Bucher - Promega Corporation
Christopher L. Grachanen (Project Leader) - Hewlett-Packard Company
Shawn B Mason - St. Jude Medical
Gloria J Neely - US Navy, Naval Surface Warfare Center
Graeme C. Payne - GK Systems, Inc.
Don Ruth - US Army TMDE
Howard Zion - Transcat

Further Metrology Job Description initiative activities will include soliciting job descriptions from NCSLI and ASQ's MQD constituents, conducting a pilot survey, conducting a formal online survey, etc. This important initiative is a wonderful opportunity for NCSLI and ASQ's MQD to collaborate on a project affecting the U.S. measurement community.

Future Topics

Do you know of a training program, an upcoming Metrology seminar, a Metrology focused academic institution or other training/education topic you would like to see highlighted in the Educator's Corner? Please contact Chris Grachanen at <chris.grachanen@hp.com>.
TRAINING INFORMATION

Courses presented by Mitutoyo Corporation:

Mitutoyo and its Institute of Metrology is a world-wide organization. We are proud to state that more than 200,000 engineers have attended our dimensional metrology seminars to date.

If you wish to register for any of the Mitutoyo classes below, or if you have additional questions, please call us at (630) 820-9666.

INTRODUCTION TO PRECISION MEASUREMENT
Mitutoyo Corp.
April 12 NCSLI Training Center, Boulder, CO

This introductory course is for anyone who is interested in learning more about the art and science of precise measurement (Metrology). If the student already knows how to use measuring gages, this class will serve as a good review course because the most effective and precise methods will be taught in the class. The course reviews the basics of dimensions both in inch and metric, basic measuring instruments such as micrometers and calipers, will be taught. Actual practice, a hands-on session, is included. How to reduce bias and variations in measurements will be demonstrated. This class also covers so called "attribute gages" such as plug and pin gages, thread gages, etc. In general, the objective of this course is to introduce students to the world of precision measurement.

DIMENSIONAL METROLOGY: APPLICATIONS AND TECHNIQUES
Mitutoyo Corp.
April 13-14 NCSLI Training Center, Boulder, CO

This two-day intermediate course is for everyone who is currently engaged in the production activities. Objective of this course is to increase and expand the knowledge base of each student in precise measurement (Metrology) and add skill and confidence in dimensional measurement. It is generally assumed that the student is already familiar with measuring gages. The class starts with the granite surface plates and immediately move into the comparison gages and comparison methods in a high-production setup. In two days, this course will cover most subjects needed for QC or QA engineers. Height gages and height standards, and more gages will follow. How to measure some of the GD&T symbols with or without a CMM will be presented. This course will be more in depth in its approach and will move into such items as Surface Roughness, Roundness, and Hardness testing methods.

INTERPRETING GD&T (2-day course)
Mitutoyo Corp.
April 19-20 NCSLI Training Center, Boulder, CO

This course provides a practical, easy understanding of Geometric Dimensioning and Tolerancing as it applies to the ANSI/ASME Y 14.5M - 1994 standard. The GD&T concepts are given in a methodical manner to help ensure that the participant has a full understanding of the meaning and use of GD&T. Print reading exercises containing GD&T callouts are used throughout this program. This course is ideal for manufacturing technicians, machinists, engineers and quality control inspectors. It covers both the basics and mid-level concepts in layman's terms. The interpretation skills learned in this course should be understood and mastered before standard or advanced inspection techniques are used. Mitutoyo offers Seminar #240, Inspecting GD&T, to further expand knowledge and verification methods and build on the concepts learned in this course.

INSPECTING GD&T (Geometric Dimensioning and Tolerancing)
Mitutoyo Corp.
April 21 NCSLI Training Center, Boulder, CO

This course is intended to clarify inspection methods of GD&T Specifications. There are very few published texts on inspection correctness; therefore, many interpretations are made. Some methods may be correct and many are not. This course is specifically for the machinists, quality control inspectors, quality technicians and engineers who must verify dimensions and tolerances. The intent is to have manufacturing, inspection, and engineering agree on the methods and results to the GD&T callouts. An assumption is made that participants have taken a GD&T course such as Mitutoyo's Seminar #140, Interpreting GD&T, and have a working understanding of standard inspection equipment (see Mitutoyo Seminars 101 and 102). Additionally the presentation targets whom, when and where the inspection process should take place. For more advanced CMM inspection methods, see Mitutoyo's CMM courses.

UNCERTAINTY/SPC ANALYSIS
Integrated Sciences Group
1-800-400-7866
training@isgmax.com.
May 9-12 & Sep 19-22 NCSLI Training Center, Boulder, CO

$1,895 per student. This four-day course provides straightforward and easy-to-understand principles of measurement uncertainty analysis. Concepts and methods are consistent with those found in ANSI/NCSL Z540-2, the "U.S. Guide to the Expression of Uncertainty in Measurement." Advanced measurement uncertainty analysis topics are also presented that extend these methods and concepts. Hands-on analyses using ISG's UncertaintyAnalyzer software provide practical application of important concepts to the development of uncertainty estimates for direct measurements, multivariate measurements and measurement systems.

PRINCIPLES OF METROLOGY
Fluke Corporation
www.fluke.com/2005caltraining
caltraining@fluke.com
(425) 446-6330
July 18-22 NCSLI Training Center, Boulder, CO

$2495 per student. This five-day in-depth workshop offers extensive hands-on time on a wide range of instruments. The course covers all aspects of dc / low frequency electrical/electronic measurements and calibration. Participants will become more productive in calibrating test instrumentation. Topics Include:
• Evaluating and calculating measurement system uncertainty
• Loading errors and how to predict and avoid them
• Lead impedance and when to be concerned
• Low level measurements
• Thermal EMFs and how to avoid them
• Grounding and guarding, when to use and why
• Laboratory tools, such as bridges, null detectors and dividers

A full complement of calibration equipment is available to allow each student to perform several measurement exercises to exemplify the principles and techniques covered in the discussion sessions. Included are some exercises which represent methods of extending traceability to measurement and calibration levels that otherwise cannot be obtained. The purpose of these exercises is to stimulate the student's thinking beyond the limits generally constrained by calibration procedures.

The techniques required to extend measurement parameters are discussed. Students will begin to see and use creative techniques for their measurement and calibration requirements. The course is recommended for engineers and technicians with an electronics background whose work involves measurements and calibration.

MEASUREMENT UNCERTAINTY CLASS
Quanmetec Corp.
Karen Moor, (810) 22507577
<info@quanmetec.com>

April 18-20 Sponsored by Lab Accreditation Bureau, Detroit, MI
June 13-15 Detroit, MI
July 18-20 Hosted by QC Inspection, Minneapolis, MN
August 22-24 Hosted by QC Inspection, Schaumburg, IL
September 19-21 Harrisburg, PA
October 17-19 Dallas, TX

$1395 per student. Attendees will receive 3 days of hands-on Measurement Uncertainty training based on the GUM Method, plus a copy of our book, “Measurement Uncertainty Analysis Fundamentals” and a licensed copy of our software, “Uncertainty Toolbox for Microsoft Excel” developed by Quanmetec. See our website at www.quanmetec.com for additional information and our unique class guarantee.

AUDITING TO ISO 17025
Quanmetec Corp.
Karen Moor, (810) 22507577
<info@quanmetec.com>

April 21-22 Sponsored by Lab Accreditation Bureau, Detroit, MI

(This is the only public class scheduled for 2005 in the USA)

$795 per student. Become qualified to be an Internal Auditor for ISO 17025 compliance by taking the same course that we teach to Laboratory Accreditation Assessors. This 2-day course covers the full standard as well as provides tools and guidance on how to perform and document your Internal Audits. Get it right the first time with professional training on your side. Includes a CD loaded with tools and forms to simplify the required documentation of your internal audit.

MANAGING YOUR UNCERTAINTIES (New Class)
Quanmetec Corp.
Karen Moor, (810) 22507577
<info@quanmetec.com>
<www.quanmetec.com>

November, 2005 Detroit, MI

$1195 per student. Attendees will receive 2 days of hands-on training PLUS a licensed copy of “Measurement Uncertainty Manager” for Microsoft Access. One of the biggest challenges facing those tasked with calculating their laboratories required measurement uncertainties is first identifying all the measurements needing uncertainty estimates and then linking the estimates to the data reports. To assist laboratories in this requirement, Quanmetec is developing a software database tool using Microsoft Access 2000 called “Measurement Uncertainty Manager”. This tool will become available for purchase in 2004. In order to support the proper use of this tool, we are offering a 2-day class immediately following our 3-day Measurement Uncertainty Class on specific dates.

The software will provide several features, such as a system to link your analyses to your data reports as well as control and document required reviews. The system will help you organize families and groups of devices submitted for calibration so that you can provide measurement uncertainty estimates for all your measurements based on a minimal amount of actual uncertainty budgets. This feature alone will serve you more than the software/training costs. The database will also provide guidance on contributors for various common industry measurements and interface directly with Quanmetec’s “Uncertainty Toolbox for Microsoft Excel”. Students are required to first take Quanmetec’s Uncertainty Class and be a licensed user of “Uncertainty Toolbox”.

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345IM COUNTRIES NOW CAN RECEIVE ONLINE METROLOGY TRAINING

(See News from the NMI’s, page 42)

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BLUE MOUNTAIN QUALITY RESOURCES, INC. & ECALIBRATION.COM 2005 TRAINING COURSES

Our 2005 courses are designed as FDA-GMP compliance, analytical metrology, and physical metrology courses. They are presented by instructors who are well qualified to present particular aspects of asset management issues relating to calibration, maintenance, metrology, and qualification applications in the pharmaceutical, biotech, laboratory, R&D, and production environments.

Individual and group discounts are available. Register for more than one course and receive 10% off your registration fee. Two or more individuals from the same company who register at the same time receive 10% off their registration.

Calibration Program Fundamentals & Best Practices
April 26 - 27, 2005 in Northbrook, IL
June 22 - 23, 2005 in Morristown, NJ
Ralph Bertermann continues to share his knowledge and expertise as the instructor for this class. A successful calibration program within a corporation does not operate alone but rather it must interact with management, users, quality assurance departments and regulatory affairs.


$1,200.00 per student.

**Physical Metrology**
April 28 - 29, 2005 in Northbrook, IL

The Physical Metrology two-day course presented by Michael Bird will focus on pressure, force, torque, mass (including operational principles of electronic balances) and dimensional measurements. Detailed examples of measurement uncertainty analysis are discussed for each discipline. The course examines the changing role of physical metrology and the importance of knowing exactly where you stand in the measurement and traceability chain.

<http://www.ecalibration.com/ecalibration/TrainingClasses/physical_met.htm>

$1,200.00 per student.

**GMP Maintenance Excellence**
June 24, 2005 in Morristown, NJ

Maintenance programs have long been identified as being a critical component of any efficient operation. Maintenance in FDA-regulated industries takes on additional importance because of the role it plays in the validation and production processes of a quality product. The instructor, Joe Busfield, stresses the importance of maintenance activities in the regulated environment remaining focused on maintaining the validation of the equipment and facilities when they were started-up.


$595.00 per student.

**CRYOGENIC ENGINEERING TRAINING**
July 25-28, 2005
Boulder, CO


Contact:
Dr. Thomas Flynn
(303) 665-8302 F (303) 665-0222 Email: <thomasflynn@Comcast.net>
Syllabus and registration forms at:
<www.cryoco.com>

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**CHECK WEBSITE FOR UPDATES**
<www.ncsli.org/training/>

**NMI TRAINING INFORMATION**
The NCSLI website contains additional information regarding training courses offered by the National Institutes of Measurement, such as NIST and CENAM. Click “Training” in the left-hand column, then “NMI Training Programs.”

**NCSLI TRAINING INFORMATION DIRECTORY**
See the “Training Information Directory” on the NCSLI website to search for training offered by our member organizations.

Member Delegates (of corporate memberships) can post related training materials on the NCSLI website. Click on “Training Information Directory”, then “Add/Update Resources” and follow the steps.

Please send Training Information additions and corrections to the NCSLI International Business Office, (303) 440-3339 FAX:(303) 440-3384, or E-mail to <info@ncsli.org>
REPORTS FROM THE REGIONS

INTERNATIONAL REPORT

A NEW NMI—AFGHANISTAN

Ed Nemeroff

Editor's Note: This report sets a new meaning for the word, intrepid. Ed’s report from Afghanistan must set a new benchmark for duty beyond the call for our world of metrology.

Here is some news. There is a new NMI in the world. I recently returned from a metrology-related trip to Afghanistan. Needless to say it was an eye-opener and a unique experience. I was part of a 5-man team that went to Kabul for 7 seven days in late November, 2004. My task was to work with the newly created Afghan Standards, Metrology and Quality Authority (ASMQA). This new organization is part of the reconstruction of Afghanistan.

At present there are only 4 people in the ASMQA, so they are starting from a zero base. The new organization is headed up by Chairman Dr. Akram Fazed and his Deputy, Vice-Chairman Dr. Najib Tabibi. Prior to the meeting in Kabul, I had the pleasure of spending a few days in Kazakhstan with Najib, when he attended our Central Asian NCSLI meeting and regional Cooperation on MAS-Q, which I had previously reported on in this newsletter. I'm pleased to say that they will shortly become a full member of the regional cooperation and possibly a NCSLI member.

Afghanistan has gone through a lot of turmoil over the past 35 years. Afghanistan’s recent history is a story of war and civil unrest. The Soviet Union invaded in 1979, but was forced to withdraw 10 years later by anti-Communist Mujahideen forces, supplied and trained in part by the U.S., Saudi Arabia, Pakistan, and others. The Communist regime in Kabul fought on until collapsing in 1992.

Fighting subsequently erupted among the various Mujahideen factions, giving rise to a state of warlordism that eventually spawned the Taliban. Backed by foreign sponsors, the Taliban developed as a political force and ultimately seized power in 1996. The Taliban were able to capture most of the country, outside of Northern Alliance strongholds primarily in the Northeast. Following the 11 September 2001 terrorist attacks, a U.S., Allied, and Northern Alliance military action toppled the Taliban in late 2001.

Afghanistan is slightly smaller than Texas, and has a population of about 28 million. There is a new government as of the end of November 2004. President Hamid Karzai was inaugurated during our visit. U.S. V.P. Cheney and Defense Secretary Rumsfeld were present. Security was at full alert. I was fortunate to meet some of the President’s new cabinet. Most of the new government is made up of individuals that fled the country many years ago, were educated in the west, and are now returning to build a new Afghanistan.

Technical issues that face Afghanistan include the lack of natural fresh water. They consume more energy than they produce. In general, the country suffers from enormous poverty, a lack of skilled and educated workers, a crumbling infrastructure, and widespread land mines.

It was a memorable experience for me, and it looks like I'll be returning there for a few short visits in 2005. NIST and USAID are involved in assistance programs. If any of you are interested in participating, we will be looking for some technical specialists in the field of building construction, petroleum products and pharmaceuticals to do some short term consulting. Just let me know.

Our world-traveler, Ed, poses with some of his metrology installation group. We wish them the best of results and safety.
Seems like this is a little like the old West in the United States. Check your gun to get in the saloon.

(For our Afghan colleagues, please understand that we try to maintain some sense of humor in our work)

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INTERNATIONAL REGION

Dr. Malcolm Smith, V.P.

For my first report, I am indebted to Klaus Jaeger, retiring V.P. of International. So far as activities go, I attended the EUROLAB General Assembly in Bilbao, Spain, on the 18th of March. We reached a mutual agreement with EUROLAB last year to give each other non-voting affiliate status. That's a report for the following Newsletter.

Steve Stahley and Salvador Echevarria are planning follow up automotive seminars in Mexico, to take place during the second quarter; dates as yet unspecified.

Report by Klaus Jaeger

AMERICAS

Malcolm Smith

NCSLI/CENAM automotive seminars

In October, we hosted, with CENAM, two seminars aimed at the auto industry in Mexico. Our activities were led by Steve Stahley and CENAM’s by Dr. Salvador Echeverria. Steve reported good feedback in both seminars - participants want a continuing focus group or “Club” just for automotive metrology. This fits very well into our NCSLI model and CENAM will promote the formation of these activities.

Steve recommends that we consider a second section in Mexico. This would be in the SLP/Queretaro area. CENAM has agreed to help identify a section leader and promote participation. He and Salvador believe there should ultimately be 3 sections based on major industrial concentrations in Mexico. Steve and Salvador have already discussed running a second program in the spring in 3 different cities.

NCSLI booth at CENAM's Simposio de Metrologia 2004

Graham Cameron, with assistance from Roberto Benitez and his wife Elvia, manned an NCSLI booth at this CENAM-hosted event. Graham reported considerable interest in the NCSLI, with about 40 individuals spending time at the booth. Graham reported that Roberto's presence was of great assistance (with the need for Spanish) and that the booth gave NCSLI tangible support to CENAM and a visible presence to the attendees. Coupled with the automotive seminars, our booth at the Simposio substantially raised our activity level in the Mexico region from previous periods.

New Members

Peru's NMI has expressed interest in joining NCSLI and I believe will do so. I am aware of 1 direct membership inquiry from the automotive seminars. I don't know the outcome and there may have been other direct inquiries.

Report: Automotive Industry Targeted Seminars

Steve Stahley

During the week of October 18th, 2004, two one-day conferences were offered in a joint effort between CENAM and NCSLI in Saltillo and Queretaro, Mexico. These seminars were focused on subjects pertinent to the automotive industry in the areas of measurement standards, technology and services. These seminars were developed to assist companies that supply to the automotive industry to understand requirements placed on them through various quality standards and what types of services are available to them from within Mexico. Sessions were provided on subjects including the Automotive Industry Action Group (AIAG) Measurements System Analysis (MSA) and related documents including ISO TS16949 and Production Part Approval Process.

The objective of the seminar was to provide a targeted promotion of CENAM and NCSLI through training to a given industry. This industry focus allowed seminar material to be presented at a very detailed level and in turn provide the participants information that they can directly apply to their every day work. In this way it
helped to show a link of CENAM and NCSLI directly to the automotive industry and in turn show how these organizations support industry and the value of being involved with them.

**Lessons Learned for this type of event:**

*Registration:* Registration to the seminar was initially set up through the NCSLI web site. First and foremost this process for registration must be done in the native language of the country in which the seminar is offered. A future consideration might be to have a parent NCSI site, but have sub-sites in various languages, Spanish as an example, so that potential members can get information on NCSI in their native language. This is not to say that all of the NCSI web site content be translated, but information that is generally static or information on upcoming events should be available other languages.

*Joint Venture with local NMIs:* Connection to the local NMIs, in this case CENAM, is critical for this type of seminar. It is important that companies that attend the seminar are provided a local resource for the services and information provided. Also when issues arise the local NMI can help to work through these issues, for example in this case CENAM took over registration to assist those who can not speak English. Without this assistance the seminar would have had very limited attendance, one week prior to the event only 6 people had registered thought NCSI, but in reality there were many more registered though CENAM. Also the local NMI can be much more effective in working out the logistics for the seminar. CENAM did an excellent job of working thought their local contacts and network to find locations and work out logistics for the seminars.

*Industry Focused event:* By focusing on a specific industry you can design a program that speaks directly to the attendees every day issues. In this instance we were able to put together a discussion on Automotive specific quality system, lab accreditation and technical measurements requirements that only applies to the Auto industry. This also helps the attendees to justify to their management attendance, if they can show the subject is directly related to their job.

*Take the event to the student:* As this type of "Road show" is industry focused, site location is critical and must be located in cities were the industry is very concentrated. This then also reduces the need for the attendees to travel long distances and helps them again to justify attendance.

*Include the local NCSI leader:* Where practicable assure the local section coordinator attends. In this case the local section coordinator was a paid attendee, but in future events of this type we should consider allowing the local section coordinator attends complimentary. Further it would be a good idea then to have the local coordinator provide information on NCSI and discuss local meeting and events.

Attendees: Salitillo: 15 attendees; Queretaro: 41 attendees

**Appointment:**

I appointed Dr. Joao Alzroo Her de Jornada as the coordinator for Region 2200, South Atlantic of Latin/South America. This region was formerly Brazil only and now includes the South Atlantic countries: Brazil, Uruguay, Argentina, Chile, and Paraguay (same structure as used by SIM).

**Metrosul IV**  
*Klaus Jaeger*

On behalf of the NCSLI, I attended the Metrosul IV conference in Foz do Iguacu, Brazil. I presented two papers. The first one was during a panel session on Proficiency Testing. I presented an overview of PT activities in the U.S. for physical metrology standards. The talk relied heavily on input provided by Jeff Gust from Quamecet and from information provided by A2LA. The second talk was on NCSLI activities and future trends in metrology.

The conference was attended by over 400 people with several representatives from foreign countries. I was the only one representing the U.S. Planera sessions were scheduled every morning, followed by short paper sessions as well as workshops in the afternoon. Poster sessions were scheduled every evening from 18:30 until 21:00 in the exhibit area. Simultaneous translations were provided from Portuguese into English during all planera sessions.

**ASIA / PACIFIC**  
*Klaus Jaeger, Acting Deputy #2*

Dave Agy attended the regional metrology meeting in Japan.

**EUROPE**  
*Klaus Jaeger, Acting Deputy #3*

I appointed Liviu Masalar from Belgium as coordinator for Central Europe, Region 3400. This region includes members in Belgium, Netherlands, Luxemburg, Germany, Switzerland, Austria, and Czech Republic. Dr. Seton Bennett from the NPL in England is still seeking a coordinator for the United Kingdom and Ireland (Region 3100).

**MIDDLE EAST / AFRICA**  
*Charlie Motzko, Deputy #4*

No activity in the region.

I am submitting a preliminary plan (see below) for an outreach program into the Middle East/Africa region to stimulate interest and promote NCSLI International.

This is a proposal to see if NCSLI International is interested in proactively reaching out to the metrology community in the region employing some unconventional methods to off-set travel requirements and encourage full involvement of the regional metrology community.

I am soliciting comments, suggestions and feedback on the preliminary proposal.

**Proposal for a NCSLI Middle East & Africa Outreach Plan**

Purpose: Establish a base line on needs and requirements for the Middle East and Africa Region that is feasible for NCSLI to fulfill. Promote NCSLI with "push" marketing techniques. Define a structure to determine unique regional requirements that is transportable across all regions.
Reports from the Regions

Q1-2005

• Introductory and informative letter (e-mail) to all NMI's and contacts in the region, including:
  • Jan05 BoD highlights
  • Outline resources currently available from the Boulder office
  • Call for Volunteers/Coordinators/Envoys
  • Promote interactive dialog among region members and with NCSLI

Q2-2005

• E-mail Apr05 BoD highlights
• Anonymous Web Needs and Requirements Survey hosted by NCSLI business office (if resource approval is given); if no approval for anonymous web site, then surveys e-mailed back to my NCSLI e-mail address. Basic survey elements are:
  • Needs & Fulfillment Survey (if approved) with the basic elements of:
    • Likert Scaled survey ~ 10 questions
    • Survey structured for cross-sectional and SPSS analysis (including Factor Analysis) employing the Likert Scale
    • Demographic data (Optional)
    • Section for comments/request/etc... (Content Analysis used here)
  • Offer to host regional meeting (~ 2+ hrs) at Aug 2005 Washington DC Workshop & Symposium
  • Solicit regional needs and requirements for 2006
  • Call for Volunteers/Coordinators/Envoys
  • Promote interactive dialog among region members and with NCSLI

Q3-2005

• E-mail Conference Highlights
• E-mail Aug-05 BoD highlights
• E-mail Regional meeting minutes (if held)
  • Action items from meeting
  • Call for Volunteers/Coordinators/Envoys
  • Promote interactive dialog among region members and with NCSLI

Q4-2005

• E-mail Oct-05 BoD Highlights
• E-mail results of Needs & Fulfillment Survey (with full explanation, analysis and raw data) and shared with Regional Mailing List and BoD
• E-mail 2005 Regional Recap
  • Request for regional inputs on where NCSLI can be of most help or provide resources
  • Call for Volunteers/Coordinators/Envoys
  • Promote interactive dialog among region members and with NCSLI

May 25, 2004
ENI Products Group
Rochester, NY
Lyle Laukaitis, Upstate New York Section Coordinator

On May 25, 2004, the NCSLI Region 1122 Spring Meeting was held at the ENI Products Group of MKS Instruments in Rochester, NY. The meeting was hosted by Kevin O’Grady, calibration laboratory supervisor at MKS/ENI in their spacious employee training facility.

After registration, a continental breakfast, and some time to get reacquainted, the attendees and speakers all introduced themselves and their companies to the group. Kevin welcomed the group to MKS and Group Sales Manager Al DiGuiseppi gave everyone an introduction to the types of equipment made by the ENI Products Group and the markets they serve.

New members and first time meeting attendees were given an overview of NCSLI and ways in which they could get more involved in the organization locally. We then looked at the different educational opportunities at the upcoming Salt Lake City, UT conference.

Editor’s Note: Yes, this was the Spring 2004 meeting. I have noted that I am very tolerant with publishing dates, since they might have covered something of interest to another member delegate.

Tim Holt, Instrument Product Engineering Manager of Bird Electronic Corp., began our technical presentations. Tim gave a great introduction to the world of RF Calorimetry. His talk gave us all an understanding of the different methods of measuring RF power and the tremendous advances that have been made in that specialized field of measurement. Tim also provided handouts that gave us a chance to do further study after the meeting.

Our second presenter was Keith Bennett, Director of Metrology for Transcat, Inc. His discussion was titled; ISO/IEC 17025: Pros and Cons. Keith involved the group in an interactive discussion in which we talked about the benefits of being accredited to the standard for both the laboratory and their customers. He also talked about some of the barriers to getting accredited and what you cannot assume about a company just because they are accredited. Keith closed with a question and answer session that covered topics ranging from MRA’s to measurement uncertainty requirements.

The next presentation was given by Steve Griffin, Regional Sales Manager for the Fluke Corporation, always an educating and entertaining NCSLI presenter. Steve gave an in-depth look at the changes we are seeing in the calibration laboratory. His topic for the meeting was: Precision Reference Multimeters; Migrating from classical techniques to modern measurements. The benefits to the lab in terms of time, accuracy, and reduced numbers of standards to maintain were submitted to the section. Steve gave us a trip down memory lane with his photographs of racks of individual calibrators and standards along with the space and time saving Multimeters of the new generation.

A wide range of delicious lunch options was given in the MKS/ENI lunch room, and the section had an opportunity to discuss further the presentations of the morning and get caught up on what each other
had been up to. After lunch everyone went outside for a photograph.

After the photograph, the section was treated to a tour of the MKS/ENI facility to see how the state-of-the-art facility designs and manufactures industry-leading RF Power Generation equipment. Everyone thoroughly enjoyed the tour. It was educational and also a chance to walk off all that fine lunch.

Our final technical presentation of the day was given by Bonnie Zechmann, Account Manager for Tektronix. Bonnie gave an extremely educational discussion and demonstration of State-of-the-Art Oscilloscope Technology. Her experience with the ways that oscilloscope technology has improved over the years was beneficial to all who attended. Most guests were surprised with how far Tektronix has been able to improve on the oscilloscope. Increasing sample rates and controllability via software has allowed this versatile piece of test equipment to be used in an ever-increasing range of applications.

The meeting ended with a meeting wrap-up and an abundance of door prizes being given out. My thanks go out to Kevin O’Grady and his team at MKS Instruments’ ENI Products Group for all their effort in putting together a great section meeting and their generous donation of door prizes.

I am pleased to introduce Pat Butler to the NCSLI membership as the new section coordinator for Michigan.

Pat works for Robert Bosch Corporation. He’s taking over for Lonnie Spires. Lonnie has taken the position of Northeast Division Vice President. I am confident that Pat will do a great job as section coordinator. I understand that he is already putting a plan together for a meeting in late April or early May.

I would also like to take this opportunity to thank Lonnie for his time as Michigan Section Coordinator. The job of section coordinator is a very important one to NCSLI and the membership, since it is the position that brings the two together throughout the year. Lonnie did an excellent job at it.

It doesn't hurt to reintroduce the rest of the Midwest Region leadership, so here goes:

Tom Powis is the Northern Ohio Section Coordinator. Tom owns Broadview Instrumentation just outside of Cleveland, Ohio. Tom has been the section coordinator there for a number of years and is a great resource for any members in his area.

Charlie Mays is the Southern Ohio and Northern Kentucky Section Coordinator. Charlie works for BioNetics at the Air Force Primary Standards Lab in Heath, Ohio. He is planning another one of his spectacular meetings for April 6th 2005.

Marcus Freeland is the Central Indiana Section Coordinator. Marcus works for Tangent Labs. He is fairly new to the section coordinator job and will be having his first meeting soon.
Doug Leonard is the Northern Indiana Section Coordinator. Doug works for L.A.B. He is in the process of planning a section meeting, tentatively set for March 18th 2005.

I would like to ask all members of NCSLI in the Midwest Region to consider helping out in some fashion. Please contact your section coordinator to offer to help plan or host a meeting. Perhaps you could help with recruiting, or present a paper. The organization works best when we all pitch in to help.

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Feb. 11, 2005
El Faro Hotel
Aguadilla, Puerto Rico
Angel Pabellón,
Puerto Rico Section Coordinator

The first 2005 PR section meeting was held at El Faro Hotel in Aguadilla, Puerto Rico. Our meeting was attended by over 20 representatives from the government and industry of Puerto Rico and Barbados. Section coordinator Angel Pabellón welcomed the group, and began the morning session with an overview of NCSLI. He then presented the downloaded video “What is NCSLI?” from the NCSLI website.

Georgia Harris, NCSLI V.P. Education and Training, presented information on the January 2005 board meeting, highlighting items of special interest to the primarily Spanish-speaking audience. For example, the NCSLI membership application is available in Spanish on the NCSLI website, the NCSLI Glossary has been translated into Spanish and is currently being reviewed. The 2005 Workshop and Symposium in Washington, D.C. will have the keynote, plenary, and international tracks translated into Spanish.

Reinhard Schwind, Sartorius Corporation, presented a technical discussion on “Balances & Scales in Analytical Environments.” The presentation focused on metrology terminology and its application to balances and scales. It covered the requirements of Equipment Qualifications (EQ) as used in the pharmaceutical industry (one of the largest industries in PR) and the related requirements for DQ, IQ, OQ, and PQ (respectively, design qualifications, installation qualification, operational qualification, and performance qualification). Reinhard also discussed requirements associated with facilities and environments to achieve the best weighing performance from balances and scales, and weighing requirements from the U.S. Pharmacopoeia.

A presentation and discussion followed lunch on NCSLI Education and Training activities, led by Georgia Harris. NCSLI has a training resource/lending library that is available to members. The group was invited to suggest ideas/activities that NCSLI could/should consider for metrology education and training.

Ideas from the group regarding metrology education and training included several key points. There is a need for recognition of formal educational programs. Several of the participants in the session have degrees in related scientific areas (electrical engineering and physics were specifically identified), but noted that there is no clearly defined career path for metrology.

Having on-line resources and courses available is critical and allows faster access by anyone from almost anywhere. E-business, e-technology, and the speed at which things are changing was noted as a factor which means metrology education and training need to follow suit (electronically, with more access, and faster).

On-line courses can provide certificates much as on-site training can, which is essential for documenting training for auditors (especially in the GMP environment). However, the advantage of obtaining a degree or a certification (in addition to certificates of course completion and even CEUs) was reinforced by several participants. They also noted the idea of collaboration among degree-offering programs and on-line and off-site reinforcement to reach a wider audience. Examples of educational programs that could be a part of collaboration efforts included the University of Phoenix, the University of the West Indies, and a program in San Juan that offers an associate degree in electronic instrumentation. There is also a project in PR to put a licensing system in place for electronic instrument technicians.

The fact that there is no “defined career path” for metrologists and technicians was raised several times (and reinforced comments made during education and training workshops held at the Measurement Science Conference and Board of Director’s meetings in January). The career issues were discussed as a means of getting students interested in metrology at an early age. There is a lack of general awareness among the population of metrology as a science. It was also noted students in related university programs need opportunities to see metrology in practice as a part of their education (field trips and internships for scientists and engineers to working metrology laboratories).

Additional discussion covered the next generation of technology and its impact on the need for trained metrologists. One key area is the need for education and training in software development, software validation, integration of software in measuring instruments, and automation - all as related to metrology.

The group ended the day with a brainstorming session about ideas to enhance and develop the PR section, which was then followed by drawings for NCSLI door prizes. Posters promoting the 2005 workshop and symposium were also given to participants to hang in places likely to draw interest in NCSLI. Several people volunteered to be a part of a section steering committee to help identify additional organizations that may wish to participate, to find technical speakers for the section meetings, and to help with logistics and administration. The use of the NCSLI Forum for “Spanish speakers” as a neutral location to share metrology questions and ideas was also brought up during the brainstorming session.
Reinhard Schwind of Sartorius Corporation reviews measurement details of balances and scales.

The location Section Coordinator picked for his meeting looks pretty relaxing.

So did one of the guests fly in on the El Faro courtesy airplane, and never left?

Membership for 1321 is on the rise with new participants at each meeting. Chris Grachanen from HP Houston, started the meeting with an overview from the NCLSI Board of Directors.

Mike Eckart, from TEGAM, demonstrated the use of the new 1827 Portable Power Sensor Calibration System. Mike demonstrated to all of those in attendance the use and cost savings associated with the new product. Mike also presented a very detailed analysis on how to calculate measurement uncertainties associated with power sensor calibrations. Mike did an excellent job of explaining the details in an easy-to-understand, yet comprehensive way.

Lunch was provided by Tina Brumley from Test Equity. The lunch featured Italian cuisine that was extremely good. Our thanks to Tina and Test Equity for furnishing the lunch and snack during the meeting.

Ronnie Eubanks conducted a safety awareness discussion on typical items that may be missed by metrology laboratories in their day-to-day operations. Ronnie’s presentation was very informative and covered many areas that we in the metrology field might not think of. He also included regulatory requirements and potential fines associated with infractions of these safety practices.

Gregg Shuman presented a new way to judge customer satisfaction. Typically, laboratories rely on turn-around-time (TAT) as a measurement of whether or not the laboratory is meeting contract requirements. His new method of making this measurement is using On-Time-Delivery (OTD) objectives as a better method to measuring the customer’s experience.

Our next meeting is scheduled for April 15, 2005, location to be determined.
I guess Houston is no longer only an oil town, like it was when I was an aviation cadet in the USAF in 1955. Well, there was Ellington AFB, which grew in technology immensely during the moon shots of the Apollo program of the 1960s. Gregg and Chris Grachanen are building NCSLI membership nicely.

U.S. Department of Labor Bureau of Labor Statistics Metrology Job Descriptions Initiative. Chris explained how the Standard Occupational Classification (SOC) System is used by Federal statistical agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data and how educators use the SOC to provide students with career guidance information.

Larry Kimmons, from Fluke Corporation, presented enlightening and highly fascinating information regarding workplace safety and instruments used on high-energy applications. Larry discussed high-energy work environments and unseen electrical hazards. He also discussed transients, arc flashes and their causes.

The last speaker of the morning was Howard Williams, from Tektronix. Howard provided a very practical look at the calibration requirements for logic analyzers. Howard explained in remarkably simple terms what is required to calibrate a highly complex instrument.

A wonderful lunch was provided by our host, Hewlett-Packard.

After lunch, Roxanne Robinson, NCSLI V.P.-Industrial Programs, provided an in-depth look at amendments to ISO/IEC 17025 (1999). Roxanne described the history of the amendments to ISO/IEC 17025 and the changes that have been made to the document. She also discussed what changes are pending and how they would be implemented and the impact on calibration laboratories.

After a short break, Roxanne Robinson closed out the day with an attention-grabbing presentation titled "Laboratories and Calibration Providers: Let's Talk." This presentation sparked many questions from the attendees and generated a great deal of discussion.

In addition to the above speakers, there was an exhibit area where several local vendors exhibited their products and services. During the breaks and lunch the vendors were available to discuss and demonstrate their products with the attendees. Comments from the attendees and vendors after the meeting were very positive and they would like to see additional vendor participation at future meetings.

A special thanks to Bob Cummings and Chris Grachanen, of Hewlett-Packard, for their support in providing for the meeting location, refreshments, and lunch. Also, to the vendors that supported the mini-show to make this meeting such an immense success.

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**Attendees:**
- Kelly Ollinger
- Chris Aguirre
- Mitch Stone
- Warren Gilchr
- Phil Meltzton
- Trey Hamiter
- Eddie Dooley
- Dennis Bloom
- John Griffin
- Mike Berry
- Patrick Beauer
- Keith Scoggins
- Mike Eickant
- Perry Plummers
- Rick Hernandez
- Tommy Thomas
- Jim Dulac
- Chris Grachanen
- Terry McGee
- Mol Craven
- Jim Lawson
- Paul Daniel
- Jay Morgan
- Stan Gryzch
- Ronnie Eubanks
- Jim Johnson

**January 27, 2005**
Hewlett-Packard Co
Houston, TX
D. Keith Scoggins
South Texas Section Coordinator

The South Texas Section winter meeting was held on January 27, 2005 at the Hewlett-Packard Computer Center in Houston, Texas. Bob Cummings from Hewlett-Packard Corporation hosted the meeting, which was conducted by Keith Scoggins, the South Texas Section coordinator and metrology laboratory supervisor at the South Texas Project Nuclear Operating Company.

Keith welcomed everyone to the meeting and requested feedback on the types of presentations attendees would like to see in future section meetings.

Chris Grachanen, South Central U. S. Region coordinator from Hewlett-Packard, discussed the highlights of the October NCSLI Board of Directors Meeting. Chris was also the first presenter of the morning. Chris provided highly beneficial information regarding the
Welcome and Introductions

...Dale Varner, Lockheed Martin Denver Metrology Services

...Craig Gulka, NCSLI International Business Office

NCSLI International Update

...Craig Gulka, NCSLI International Business Office

"Introduction to Measurement Uncertainty”

...Dr. Jim Salsbury, Mitutoyo

Pressure Uncertainty

...Kari Kurtz, DH Instruments

Temperature Uncertainty

...Tom Wiandt, Hart Scientific

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October 21, 2004
NCSLI Training Center
Boulder, CO
Dale Varner,
Boulder/Denver Section Coordinator

The NCSLI Boulder/Denver Section 2004 Fall meeting included the NCSLI Measurement Uncertainty Road Show with five presentations on Measurement Uncertainty by Industry Experts including a Measurement Uncertainty Overview and Dimensional, Electrical, Pressure, and Temperature Disciplines. It was held on Thursday, October 21, 2004 at the NCSLI Training Center in Boulder, Colorado. The agenda is listed below.

Linda Bowler from Ball Aerospace & Technologies Corporation in Boulder, Colorado has graciously volunteered to host the Spring 2005 NCSLI Boulder/Denver Section which is scheduled for Thursday, April 28, the day after the Spring NCSLI Board Meeting.

Reports from the Regions

Dimensional Uncertainty

...Dr. Jim Salsbury, Mitutoyo

Electrical Uncertainty

...Warren Lewis, Sandia National Laboratories

Open Discussion, Questions and Answers

...All Members

Discussion of Spring 2005 NCSLI Boulder/Denver Section Meeting Logistics

...Ball Aerospace Representative

There were 44 people in attendance for the Measurement Uncertainty Road Show. All of the presentations were well organized, very informative, definitely pertinent in today’s measurement environment, and well received by those in attendance.

Attendees:
Gene Adamson
Ted Allison
Joe Belohlavek
Bob Bendt
Rick Blaier
Linda Boyd
Tamara Brooks
Greg Burnett
Justin Corbett
Mike Culverson
Dennis Destefan
Keith Fanta
Debi Floyd
Jim Goza
Michael Greene
Dan Hamilton
Steve Heit
Cliff Isberg
Mick Johner
Leif Johnson
Dan Johnson
Dave Kelly
Doug Kulk
Michael Lombardi
Gary Mengel
Bill Miller
Don Miller
Greg Morgan
Emily Myers
John Pick
John Ramboz
Irelehim Reda
Joe Roman
Mark Sanders
Trace Sears
Bill Sorrells
Bob Stant
James Targley
Joe Van Voovre
Dale Varner
Scott West

Lockheed Martin Space Systems
Hewlett Packard/Consultant
Ball Aerospace
Sandoz
Lockheed Martin Space Systems
Frontier Airlines
Lockheed Martin Space Systems
GB Consulting
Lockheed Martin Space Systems
High Current Technologies, Inc.
General Motors Electro Motive Division
Lockheed Martin Space Systems
Synthes
Workplace Training, Inc.
Lockheed Martin Space Systems
Square D Company
Sandoz
Sandoz
Frontier Airlines
Sandel Pharmaceuticals
Fusion Welding Solutions, Inc.
Ball Aerospace
NIST
Lockheed Martin Space Systems
Lockheed Martin Technical Operations
Sandoz
Sandoz
Eastman Kodak
Ramtech Engineering
NREL
Ball Aerospace
Lockheed Martin Technical Operations
Sandel Pharmaceuticals
A2LA
High Current Technologies, Inc.
Lockheed Martin Technical Operations
Lockheed Martin Technical Operations
General Motors Electro Motive Division

Acadata
EMI
RJF NASA/JSC
RJF NASA/JSC
Data Marketing
Talon
Ocelluscope Services
Megger
Sensor
Stress Eng. Services
SWRI
Freescale Semiconductors
Freescale Semiconductors
Instr. Repair & Calibration
Instr. Repair & Calibration
AC Consulting
Carbo Medics
GE Russia
Interface
Bruel & Kjaer
Workplace Training
Texas Calibration
Texas Instrument
Test Equity
Tucker Electronics
M&M Instruments
Davis Inotek
Deweton
Kemp Instruments

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NCSLI 2004 FINANCIAL SUMMARY

Income $1,170,581.52

Sales $715,124.90

Dues $404,175

Other $33,786.15

Conference $649,189.50

Expenses $1,215,620.61

Rent $76,243.00

Credit Card Charges $20,732.00

Scholarships/Awards $19,303.00

Conference $460,002.00

Office Operations $239,189.00

ANSI 13, $10,346.00

Newsletter 12, $51,592.00

Publications 91, $9,090.00

Member Support $13,138.00

Misc $58,061.00

Travel $19,520.00

Board of Directors $32,754.00

2003 Assets $933,252.75 2004 $1,003,045.03

2003 Liabilities $442,072.44 2004 $585,247.19

Equity $491,180.71 2004 $417,797.84

Editor's Note: Each April, I used to publish a two-page, fine print report of the previous year's financial activities, and found that there was little member interest in all the line-item breakouts. However, as a member company, you have a right to see any such detail.

If you would like further details, please contact Jack Ferris, NCSLI Treasurer, at (231) 334 4891, <sleeping_bear@hotmail.com>
COMMITTEE NEWS

ARCHIVE COMMITTEE
Jim Allred

The Archive Committee met at the 2005 Measurement Science Conference in Anaheim, California on Thursday, January 20. Discussions were held on probable methods for transferring existing paper records and information for electronic retrieval. These records include text as well as pictures from the earliest NCSLI functions. The committee also discussed the best location on the NCSLI web page for easy member access.

Jim Allred visited the Boulder office last September for a full week to catalog all existing archived material. The committee has set up a plan to scan the documents and pictures starting with the oldest records.

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STANDARDS POLICY
Doug Sugg, V.P.

U.S. MEASUREMENT REQUIREMENTS
Jeff Walden

The USMRC survey that is now on the NCSLI website is not being used by our members to the degree that we had hoped. While the response to the 2000 mail-out survey was less than we desired, the committee did get more inputs than they have from the website survey. The survey should be reviewed to ensure that it conveys the importance of the survey findings to NCSLI.

The following changes to the web version of the survey will make it suitable for use as a mailed survey:

a. Convert it to a Word document.
b. Delete the web buttons.
c. Add the questions suggested by NIST (See attached).
d. Reduce the file size to expedite email.

This survey will be mailed, both regular mail and email, to the NCSLI membership and other contacts, such as ISA, IEEE, MSC, as was done in 2000. The mailing is planned for March 2005, with the intent of having results for the committee to review and discuss at the August Workshop & Symposium.

On a topic of broader scope, the committee chair and co-chair recommend that the "US Measurement Requirements Committee" become simply the "Measurement Requirements Committee." Since we are an international society, it seems appropriate to have one requirements committee to go along with the expanded scope of being international in our concerns. Craig has noted that the Canadian Requirements Committee has not been very active. CENAM has expressed interest in a measurement requirements committee but that committee hasn't been formed yet. It might be more effective to support these groups, and others, with one overall committee. Such a committee can be organized into subcommittees, which can be formed and worked through Regional and Section Coordinators. This could prevent duplication of effort.

In addition, it might be worthwhile to consider expanding the name to the "Measurement Requirements and Capabilities Committee." While it might appear that this name change would broaden the scope, it is actually more accurate in reflecting the range of concerns that were seen in the responses to the 2000 survey.

CANADIAN MEASUREMENT REQUIREMENTS
Dave Stevens

I talked with Dave Stevens, Co-Chair of 132; he said there was nothing new to report this quarter from the Canadian Measurement Requirements Committee.

GLOSSARY
Emil Hazarian

The Glossary Committee has been collecting and consolidating comments on VIM 3rd Draft and GUM Supplement #1. The process was accelerated and finalized in the first part of September. This important task and opportunity monopolized the committee's attention until September 2004, replacing our initial goals.

The Glossary Committee's activity since the last report in September 2004 was focused on comments, discussion and resolution on the following:

• Glossary revision and the Spanish translation. No comments were received yet from South America, but we expect them in the near future, due to the reminder sent by G. Harris
• Opinions and resolution on the following:
  • National or international dictionary?
  • Will a dictionary replace the NCSLI Glossary?
  • One definition versus multiple definitions
  • Explore the possibility of adding the Quality Assurance and Statistics related terms
  • Identification of significant references (national and international standards, dictionaries, etc.) (Need volunteer)
  • Procurement of references' latest editions. (Need volunteer, check budget for resources)
  • Creating a base reference for terms and definitions in metrology including domestic and international documents, web sites, dictionaries, etc. (overlaps with the scope of the above point)
  • Identifying them for planning budget resources (Need volunteer, check budget for resources)

These objectives constituted the agenda for the meeting at the Measurement Science Conference in Anaheim, California.

130 Standard Policy

An action was taken during the last NCSLI board meeting to put together a prototype for making additional reference information available. A demo and presentation was made during the NCSLI board meeting in January.
MEASUREMENT SCIENCE & TECHNOLOGY
Richard B. Pettit, VP

Technical Program Chair Activities: 2005 NCSLI Conference

I completed review of all submitted abstracts (over 90) to the NCSLI web site. Abstract review committee consists of Karen Semer, Derek Porter, Tom Wunsch, Roger Burton, Larry Nielsen, and myself. All abstracts were reviewed on a scale of 0-5, and the lowest average score was 2.50. These were very strong unsolicited abstracts this year.

Again this year, the Invited Technical Track E is being developed by Tom Wunsch (8 sessions) and Invited International Track D is being developed by Seton Bennett (10 sessions).


Currently we have a total of 21 sessions with technical/quality/management topics. Of these, only 18 are needed to fill out the program. We have invited Wade Keith III to present the results of the 2005 NCSLI Benchmarking Survey at the Thursday afternoon session. Also, we're looking into status reports on the revision of the VIM and the development of GUM Supplements. I've continued working with both Karen Semer, U.S. Air Force, and Derek Porter, Boeing, on the overall process of performing the Technical Program Chair's duties.

Committee Reports

AUTOMATIC TEST & CALIBRATION SYSTEMS
David Seaver

In attendance at our MSC meeting, were Bob Kilgore of Northrop Grumman, Bob Stern of Agilent Technologies, Ed Yankajitis of Test Equity, Dexter Shelton of Sypris Test & Measurement, Bill Kotzky of Teradyne and David Seaver of Raytheon.

It was evident that there are many questions and concerns in the calibration community dealing with test software. Some of the areas discussed were safety, format standardization, and the requirements found in various conformance standards. The example dealing with conformance standards was defining 'validation.' The following questions were discussed -- Does 'validation' include more than just the software; does it include instrumentation etc.?

The committee decided the magnitude of the concerns was such that more information is needed. Assignments were made and the results are to be submitted to the Committee Chair.

The assignments are as follows:

<table>
<thead>
<tr>
<th>Category</th>
<th>Assignee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>Bob Kilgore</td>
</tr>
<tr>
<td>Test Uncertainty</td>
<td>Bob Stern</td>
</tr>
<tr>
<td>Design Requirements</td>
<td>Dexter Shelton</td>
</tr>
</tbody>
</table>

Different methods of validation       Bill Kotzky
Validation of Software                Ed Yankajitis

MEASUREMENT COMPARISON PROGRAMS
Jim Wheeler
Al Teruel

A committee meeting took place at MSC with 7 attendees. The committee report appears on the NCSLI Measurement Comparison Program Committee web page at <http://ncsli.org/committees/142/index.cfm> Any action items from the meeting appear there too.

There are a number of updates on ILCs. They appear in the updated table on the committee webpage along with all contact information.

Briefly: The RF Power ILC, coordinated by Bart Schrijver (Agilent Technologies), has been completed. A report was distributed to all participants. A new high resistance ILC (1 GOhm) is proposed by Jay Klevens (Process Instruments Inc). John Cable is no longer coordinating the ARFTG round robins and has relinquished that role to Ron Ginley at NIST Boulder.

The update of RP-15 “Recommended Practice for Interlaboratory Comparisons” has been forwarded to NCSLI Publications. All incorporated changes to the RP have been made along with a revised list of past conference Interlaboratory Comparison reports.

For further information, contact Jim Wheeler (619) 545-9698 <james.c.wheeler@navy.mil> or Al Teruel (619) 545-2857 <albert.teruel@navy.mil>

INTRINSIC & DERIVED STANDARDS
David Deaver

The committee met at the 2005 Measurement Science Conference.

Several reports are in process, including: Revision to the Catalogue of Intrinsic/Derived Standards; Argon Triple Point Cell RISP; Platinum Resistance Thermometer Handbook; Revision to the Pressure RISP (a status report was presented at the 2004 Conference by Ruben Salazar, Boeing); and Bob Harding has finished developing an additional humidity uncertainty example - he has been supported by Thunder Scientific for this activity.

The next Josephson Volt ILC will start in CY 2005. There was another organizational meeting at the 2005 MSC to finalize participants, assign responsibilities, and approve the procedure. NIST will participate in the ILC, using their new portable Josephson Volt system to monitor the standards at three selected pivot laboratories. The JJ ILC Organizing Committee consists of the following five members: Dave Deaver, Fluke; Clark Hamilton, Vnetics; Harold Parks, Sandia; Yi-hua Tang, NIST; and Barry Wood, NRC.

Ruben Salazar, Boeing, is heading up a working group that is in the process of revising the Pressure RISP. Basically, the document will be re-formatted to agree with the current NCSLI RP style and an additional uncertainty example for performing a cross-float calibration will be added. R. Petit will assist with the document revision and re-formatting. Ruska is assisting with the development of the figures.
CHEMICAL METROLOGY
Burt Sutherland

Burt Sutherland will be attending the 2005 Pittcon meeting, with the goal of recruiting members for the committee. If possible, he will set up the NCSLI portable booth at the exhibit hall.

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INDUSTRIAL PROGRAMS
Roxanne Robinson, V.P.

HEALTHCARE COMMITTEE
David Walters

No meetings have taken place since the annual workshop. However, the committee is active in preparing to update RP6. Discussions are centering on either a complete rewrite or supplementing RP6 with the current thinking post-ANSI/ISO/IEC 17025. Also, preparation is being made for two committee meetings during the NCSLI annual workshop in Washington.

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DOCUMENTARY STANDARDS APPLICATIONS
Larry E. Nielsen, V.P.

Activities:

- Attended a meeting at NSWC Corona on October 20, hosted by the chairman of WG 1 to discuss the Z540.X WD 2.1 definition of test uncertainty ratio.
- Published article on RP-10 in Cal Lab magazine.

Committee Reports:

LABORATORY EVALUATION RESOURCES
Vacant

Reactivation of this committee is being considered to develop a handbook to ANSI/ISO/IEC 17025:2000. This committee will also develop a handbook to the new Z540.X standard once completed.

LABORATORY FACILITIES
Dr. David Braudaway
Doug Cooper

Work continues on an update of RP-14, “Recommended Practice for Selecting Standards Laboratory Environments.” Per co-chair Doug Cooper, work is underway on a new RP on verification of laboratory environments.

METROLOGY PRACTICES
Dr. Howard Castrup

Calibration Intervals

RP-1 is still under revision. Progress during the last quarter consisted of refining parameter interval analysis methods using variables data. A meeting with Dennis Jackson is scheduled for later this month to work out the details of the inclusion of linear models methodology in the RP. In addition, the Method A3 methodology and algorithm rewrite has been completed.

Measurement Decision Risk Analysis

Work during the last quarter consisted primarily of consolidating and updating risk analysis documentation from various sources -- principally, NASA Handbook 1342. This material, along with suggested changes in a draft decision risk RP outline, will be sent to subcommittee chair Karl Haynes for review.

SPC Methods

Work is still in progress on extending current ANOVA methods to cover part variation, equipment variation, reproducibility, repeatability and uncertainty growth. As reported earlier, the challenge is to develop a three-way design that can work within the constraints of the kind of data maintained by calibration organizations. Progress during the last quarter consisted of the development of methods for computing process metrics for test and calibration.

Decision Support

I am still reviewing a draft RP titled "Metrology Practices Decision Support Topics," submitted by Derek Porter of the Boeing Commercial Airplane Group. I plan to have something to show to the subcommittee chair, Pat Snyder, also of the Boeing Commercial Airplane Group, before the end of the year.

Uncertainty Analysis

We are continuing to update RP-12 and have identified a need to include additional material from the GUM as well as methods and techniques that have emerged since the GUM's last publication. We are also continuing to develop additional examples involving multivariate and systems analysis methods and examples that explore sources of error that are either not addressed in the current RP or are given only peripheral mention. In addition, considerable work has been done on methods for acquiring, interpreting and using equipment specifications to estimate parameter bias uncertainty. The documentation of these methods is underway.

WRITING COMMITTEE
Jesse Morse

The committee has voted against approval of the new working draft (WD 2.1) as the latest proposal for replacing Z540.1-1994. The proposed title was “Requirements for the Calibration of Measuring and Test Equipment.”

Report:

Two items have been worked during the last quarter:

1. "Working Draft 2.1" has been sent to committee members for vote via Letter Ballot. The vote is now closed and tallied. The results are: Affirmative = 14; Negative = 16; Abstentions = 1. The comments are being summarized and will be a subject of discussion at the January meeting at MSC.

2. I met with Craig Gulk at Boulder to review the proposed committee operation procedure under ANSI direction. It is ready to go to the committee for final review. If we have a quorum in January, we will vote on it there. The procedure mirrors the original "ANNEX A" written by ANSI in the past.
Committee News

I have agreed to continue as chair of the committee in parallel with my new duties as V.P. Marketing. I attended the Board of Directors meeting in Santa Barbara to present the committee activities in detail.

ACCREDITATION RESOURCES
James Jenkins

Work continues on final editorial work on RP-9, “Calibration Laboratory Capability Documentation Guideline.” A joint meeting with 159 Small Business Initiative committee was held at the MSC.

CALIBRATION PROCEDURES
Dale Varner

Committee 176 Membership:

Carlton, Jim  NSWC/GIDEP
Coleman, Stan  AF Metrology
Fleming, Guy  Lockheed Martin
Grachanen, Chris  Hewlett Packard
Hooper, Steven  AF Metrology
Johnson, David  Steris
Larson, Dave  Boeing
Masiello, Laurie  Masy Systems, Inc.
Mojica, Monique  Navy Measurement Science
Neely, Gloria  Navy Measurement Science
Nielsen, Larry  Southern California Edison
Pazzig, Earl  AF Metrology
Payne, Duke  Jacob Sverdrup
Plumb, Michael  Tidewater Community College
Rohde, Dave  NSWC Corona
Sanders, Mark  Lockheed Martin
Stenstrom, Jan  Brunson
Tollerud, Jan  National Institute of Thechnology
Varner, Dale  Lockheed Martin
Williams, Bob  Navy Measurement Science
Wilson, Terrelle  Lockheed Martin
Zaja, Bob  NSWC Corona

The Calibration/Certification Procedures Committee met at the Measurement Science Conference in Anaheim, CA. We had teleconferencing capabilities for the second consecutive meeting. Eight committee members attended this meeting - six in person and two via teleconference. Those members in attendance were Jim Carlton, Guy Fleming, Dave Larson, Laurie Masiello, Gloria Neely, Jan Stenstrom, Dale Varner, and Bob Williams.

We had a very good meeting and conducted an overall review of our RP-3 Draft, which was made possible due to excellent progress in our bi-monthly teleconferences in the 4th Quarter of 2004. This overall review identified several changes still to be made which will be incorporated and reviewed at our meeting Wednesday, February 2, 2005. After this, it will be submitted to Michael Lombardi, NCSLI Publications Oversight Committee, to begin its official review cycle. (Note: The RP-3 Draft was submitted for official review on February 15, 2005).

Next up on the agenda for Committee 176 is an increased focus on the NCSLI Calibration Procedures Database.

In addition to our bi-monthly teleconference meetings held on the 1st and 3rd Wednesdays of each month, this committee meets every January in Anaheim, CA at the Measurement Science Conference and every summer at the NCSLI Workshop & Symposium. Any measurement professional interested in participating in the Calibration/Certification Procedures Committee should contact Dale Varner by phone at 303-977-5523 or email at <dale.varner@lmco.com>. You do not have to be an NCSLI member or member delegate to participate.

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MARKETING
Jesse Morse, V.P.

BENCHMARKING PROGRAMS
John Wade Keith III

The NCSLI International Benchmarking Committee Chairman held a kick-off meeting for the 2005 survey in January. The Steering Committee, including the NCSLI Business Manager and special guests, Jesse Morse (NCSLI Marketing VP) and Val Miller (NCSLI Legal Metrology Committee) were in attendance.

The group discussed general strategy, reviewed prior surveys and presentations, and made revisions as needed. The survey questions for 2005 have been finalized and are now being input into the web format. The web-based survey will be ready for release on Monday, 4 April 2005.

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CONFERENCE MANAGEMENT
Carol Hockert, V.P.

2005 Conference ready for you

The 2005 conference site is the Washington Hilton and Towers, in Washington, D.C. Registration opens the beginning of March and reservations can be made at the hotel either on-line or by phone.

The Keynote speaker is Acting Director of NIST, Hratch Sernenjian. Dr. Sernenjian will speak on the topic of "Expanding the Frontiers of Measurement." Other noted speakers include Mark Hurwitz, President of ANSI, and Greg Hahn, of Clean Comedians.

There will be 20 tutorials before and after the conference. Complete course descriptions and instructor bios are available on the website.

We currently have 16 sponsors and 155 exhibit spaces sold.

The technical program has over 90 unsolicited abstracts. There will be a plenary session on Tuesday and Wednesday. There will be six tracks during the entire conference, with the exception of during the plenary sessions, for the first time ever.

The Member Delegate meeting will be held during the lunch on Tuesday. The Wildhack Award will be given at this time, and business will be conducted among the membership.

Guest tours will be offered on Monday through Wednesday, and special NIST tours of the new Advanced Metrology Labs are scheduled for Friday after the conference.

(Continued on page 49)
SCENES FROM THE
SANTA BARBARA BOARD MEETING

Retiring NCSLI President Dave Agy (l), presenting award gifts to the Board for exemplary service for the year 2004, in this case to incoming President Harry Moody.

Yeah, this is tough duty, near the beach in Santa Barbara. This season in Southern California is usually sunny and warm, interspersed with some 3-day wet weather, but this year has been disastrous, with three times the normal rainfall, at 34 inches.

Dozens of small discussions happen during the face-to-face Board meetings four times a year. (l-r) Paul Hanssen, Ed Pritchard, Derek Porter, and Harry Moody (seated). By the way, ANY member delegate is welcome to attend any of these Board meetings, held around the country. The schedule is on the inside back cover of each issue.

In my year of presidency in 1978, I used to think we worked hard at NCSLI. But now I see all the activity go by me in all their reports, and I have to admit that these industrial volunteers work a LOT harder. So, we should applaud their appearance on the beach at Santa Barbara. (l-r) Charles Fallon-ŠMJD, Ernst Garner, NIST retired, Klaus Jaeger, and Tom Wunsch.

Nothing can replace the walls full of poster paper, used for organized discussions of important matters to the future of NCSLI.

Georgiia Harris analyzes the Education and Training issue during one of the Board sessions. Georgia has moved to the Education V.P. Assignment, so she is no longer my boss.
NEWS FROM THE NMIs

Previously NIST NEWS

METROLOGY TRAINING FOR SIM COUNTRIES

The need for building the metrology knowledge infrastructure in developing countries has long been a challenge for Dr. Yoshito Mitani of Centro Nacional de Metrología (CENAM). Dr. Mitani is Chair of the Professional Development Committee for the Inter-American Metrology System (SIM) and the SIM Technical Advisor located at NIST in the Office of International and Academic Affairs. Today, computer-based online calibration and metrology training is serving to answer that challenge.

Now, thanks to support from the Organization of American States (OAS), technicians and students from industry, educational institutions, private calibration labs and NMI's staff from 34 SIM countries can log onto Introduction to Measurement and Calibration, Precision Dimensional, Electrical, Mass, Temperature and Flow Measurement. Terminology, concepts, procedures, relevant scientific principles and math, graphs and charts are combined with testing and a certificate of completion to provide the knowledge base necessary to build these skills.

For access to the training resources, make contact with your regional NMI. Each NMI has a person responsible for the training access. It is up to them to provide it within their countries. They maintain all of the access codes.

The project supports the missions CENAM, NIST and SIM to develop and promote measurement, standards, and technology to enhance productivity, facilitate trade, and improve the quality of life.

Contact: Dr. B. Stephen Carpenter, 301-975-3069, <bcarpenter@nist.gov>

Dr. Yoshito Mitani, 52 442 211 0560, <ymitani@cenam.mx>

Paul Hanssen, 952 471 8554, <phansen@wptraining.com>

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NIST NEWS

PRESIDENT PROPOSES FUNDING FOR NIST FY 2006 PROGRAMS

An increased emphasis on research to support key Administration priorities in advanced manufacturing, homeland security, and health and information technologies highlights the FY 2006 request for the National Institute of Standards and Technology (NIST) submitted to the Congress on Feb. 7 by President Bush. The budget proposes a total of $532 million in NIST funding.

The NIST budget is divided into three appropriations:

- $426.3 million for Scientific and Technical Research and Services (STRS)- an increase of 12.5 percent over 2005. It includes $420.6 million for the NIST laboratories, technical pro-

- $46.8 million for Industrial Technology Services (ITS), funding the Hollings Manufacturing Extension Partnership Program, helping small manufacturers across the nation to become more competitive and productive. Consistent with efforts to shift resources to best meet national needs, the FY 2006 budget proposes termination of the Advanced Technology Program.

- $58.9 million for Construction of Research Facilities (CRF), covering critical safety, maintenance, repair and facilities upgrades.

The proposed budget request includes three STRS initiatives that target pressing national research priorities in Advanced Manufacturing ($19.6 million), Measurements and Standards for Homeland Security ($3 million), and New Measurement Horizons for the U.S. Economy and Science ($17.2 million).

The CRF budget request includes an increase of $32 million to address pressing issues of facility modernization primarily at the NIST’s Boulder, Colo., laboratories and an increase of $3.4 million to support necessary preventive maintenance for NIST’s Advanced Measurement Laboratory, one of the world's most sophisticated laboratories and a valuable national resource for critical measurements in nanotechnology, biotechnology, quantum computing and other exciting fields.

For further information, see <http://www.nist.gov/public_affairs/releases/budget_2006.htm>.

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PBS FEATURES NIST/NARA CHARTERS OF FREEDOM WORK

The recently completed effort to preserve and protect the nation's founding documents---the Declaration of Independence, Constitution and Bill of Rights---was featured in a television documentary by Public Broadcasting System's NOVA program on Feb. 15. The program offered a behind-the-scenes look at the work of NIST engineers, National Archives and Records Administration (NARA) specialists and others who participated in the preservation project.

Titled "Saving the National Treasures," the program followed the entire project from the design of the state-of-art encasements for the documents to the building of a new Rotunda for their viewing. NIST's contribution to the NARA-directed preservation effort, included designing and building nine hermetically-sealed glass, titanium-framed cases capable of protecting the documents against all types of environmental assault. NIST partners in the project included the National Aeronautical and Space Administration (NASA) and Heery International, Atlanta, Ga.
The NOVA Web site offers a comprehensive look at the entire project, including teacher's guides at <http://www.pbs.org/wgbh/nova/charters/>.


Editor's Note: I watched this remarkable program with much fascination. It included not just the overview of the work NIST did with their terrific knowledge base of metals and materials, but it included a historical story of the documents themselves. For example, the document in worst shape visually is the Declaration and part of the reason might be that in its early years, a printer was allowed to use an offset process to transfer the ink impression onto a copper plate that was engraved to permit printing more copies of the original document. Did that accelerate the deterioration of the writing? Or was it the fact that the document hung displayed on a sunlit wall for 30-40 years at a later time?

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DEVISING NANO VISION FOR AN OPTICAL MICROSCOPE

A new optical imaging technology under development at NIST will use combinations of dynamically controlled light waves, optimized for particular properties (such as polarization). How this structured illumination field -- engineered specifically to highlight the particular geometry of each type of specimen -- scatters after striking the target may reveal features smaller than 10 nanometers.

Contrary to conventional wisdom, technology's advance into the vanishingly small realm of molecules and atoms may not be out of sight for the venerable optical microscope, after all. In fact, research at the National Institute of Standards and Technology (NIST) suggests that a hybrid version of the optical microscope might be able to image and measure features smaller than 10 nanometers-a tiny fraction of the wavelength of visible light.

In a preliminary test of the embryonic technique, NIST scientists used violet light with a wavelength of 436 nanometers to image features as small as 40 nanometers, about five times smaller than possible with a conventional optical microscope.

Roughly speaking, such a feat is akin to picking up a solitary dime with a clumsy front-end loader. If successfully developed, the imaging technology could be readily incorporated into chip-making and other commercial-scale processes for making parts and products with nanometer-scale dimensions.

The wavelengths of light in the visible part of the spectrum greatly exceed nanoscale dimensions. Consequently, the resolution of conventional light-based imaging methods is limited to about 200 nanometers-too large to resolve the details of nanotechnology, which, by definition, are no more than half that size.

Resembling a 3-D checkerboard, this mirage-like pattern was formed by light waves after bouncing off a specimen with a peak-and-valley arrangement of etched lines. Such complicated wave patterns, the result of light scattering and interference effects, may be used to discern the dimensions of nanoscale features. However, a newly begun, five-year research effort at NIST suggests that a novel combination of illumination, detection and computing technologies can circumvent this limitation. Success would extend the technology's 400-year-long record as an indispensable imaging and measurement tool well into the expanding realm of nanotechnology.

Called phase-sensitive, scatter-field optical imaging, the computer-intensive technique under development at NIST uses a set of dynamically engineered light waves optimized for particular properties (such as angular orientation and polarization). How this structured illumination field - engineered differently to highlight the particular geometry of each type of specimen - scatters after striking the target can reveal the tiniest of details.

"The scattering patterns are extremely sensitive to small changes in the shape and size of the scattering feature," explains Rick Silver, a physicist in NIST's Precision Engineering Division.

Contact: Mark Bello, <mark.bello@nist.gov>, (301) 975-3776

HELPING FUTURE ENGINEERS USE TODAY'S DESIGN PLANS

Digital design software has virtually replaced blueprints across all manufacturing sectors. STEP (the Standard for the Exchange of Product Data), a universal format for product data that allows industrial partners with different proprietary software to understand and share engineering data, has accelerated this change. The NIST and PDES, Inc., an industry consortium, have just introduced a new STEP standard that should help ensure that tomorrow's engineers will be able to understand today's complex designs.

The new standard allows more sophisticated descriptions of proprietary designs and processes. This should eliminate the need for manufacturers to understand and consult a wide variety of original software programs. The additional descriptive information covering three-dimensional mechanical designs and assemblies also should help engineers to duplicate or repair complex machines such as aircraft, or ships, long after the original design and manufacturing software has been discontinued or changed beyond recognition.

The new STEP standard, called AP203 Edition 2, supports the latest advances in product design. It can be used to express complex three-dimensional mechanical part models and assemblies with features, tolerances, and colors, which may denote, for example, specific types of systems, such as hydraulic and electrical, or other details especially important in manufacturing.

The International Organization for Standardization (ISO) is expected to publish the new STEP protocol this month for distribution and implementation by software vendors and manufacturers. NIST developed AP203 Edition 2 with private-sector partners, including aerospace, automobile, shipbuilding and computer software corporations.

Contact: John Blair, <john.blair@nist.gov>, (301) 975-4261
NIST REQUESTS COMMENTS ON DRAFT FEDERAL ID STANDARD

NIST is looking for comments on a draft Federal Information Processing Standard (FIPS) for a smart-card based form of identification that all federal government agencies will issue to its employees and contractors. On Aug. 27, 2004, President Bush issued a directive calling for the mandatory, government-wide standard <www.whitehouse.gov/news/releases/2004/08/20040827-8.html>. The directive noted that adopting a uniform format for government ID badges will eliminate the wide variations in the quality and security of forms of identification used to gain access to federal facilities and non-national security systems.

The draft standard specifies the framework, architecture and technical requirements for the personal identity verification (PIV) card, including cryptographic, biometric and card reader specifications. The requirements are graduated, from least secure to most secure, to ensure flexibility in selecting the appropriate level of security for each application. All PIV cards will include biometric information, including a photo and two fingerprints. The framework also incorporates other technical and operational standards necessary to achieve interoperability among identification cards, electronic card readers, communication systems and access control systems interfaces. The standard includes processes for issuing and managing cards, including application and approval and card maintenance and termination.

Personal Identity Verification (PIV) for Federal Employees and Contractors (FIPS PUB 201) is available at <http://csrc.nist.gov/piv-project/index.html>.

NIST expects the standard to become effective Feb. 25, 2005.

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TINY, ATOM-BASED DETECTOR SENSES WEAK MAGNETIC FIELDS

A low-power, magnetic sensor about the size of a grain of rice that can detect magnetic field changes as small as 50 picoteslas - a million times weaker than the Earth's magnetic field - has been demonstrated by researchers at the NIST. Described in the Dec. 27 issue of Applied Physics Letters,* the device can be powered with batteries and is about 100 times smaller than current atom-based sensors with similar sensitivities, which typically weigh several kilograms (about 6 pounds).

The new magnetic sensor is based on the principles of a NIST chip-scale atomic clock, announced in August 2004. Expected applications for a commercialized version of the new sensor could include hand-held devices for sensing unexploded ordnance, precision navigation, geophysical mapping to locate minerals or oil, and medical instruments.

Like the NIST chip-scale clock, the new magnetic sensor can be fabricated and assembled on semiconductor wafers using existing techniques for making microelectronics and micro electromechanical systems (MEMS). This offers the potential for low-cost mass production of sensors about the size of a computer chip. When packaged with associated electronics, the researchers believe the mini magnetometer will measure about 1 cubic centimeter or about the size of a sugar cube.

Magnetic fields are produced by the motion of electrons either in the form of an electrical current or in certain metals such as iron, cobalt and nickel. The NIST miniature magnetometer is sensitive enough to detect a concealed rifle about 12 meters (40 feet) away or a six-inch-diameter steel pipeline up to 35 meters (120 feet) underground. The sensor works by detecting minute changes in the energy levels of electrons in the presence of a magnetic field.

For further information, see <www.nist.gov/public_affairs/releases/CSMMagnetometer.htm>.


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NOVEL ZIGZAG SHAPE GIVES SENSORS MAGNETIC APPEAL

Scientists at the NIST have designed tiny magnetic sensors in a "zigzag" shape that are simpler in design and likely will be cheaper to make than conventional magnetic sensors used in portable devices. The new sensors could someday be used to measure magnetic fields in applications such as compasses, weapons detection, medicine and non-destructive evaluation of structural materials.

Described in the Dec. 13, 2004, issue of Applied Physics Letters,* the NIST sensors are made of a thin film of nickel and iron and are 35 micrometers long and 5 micrometers wide, with nanoscale design elements at the edges. The zigzag design produces the equivalent of many tiny bar magnets oriented with their north and south poles at a 45-degree angle to the centerline of the sensor (see image above). The device senses magnetic fields using a small electrical current sent down the centerline. Tiny changes in the magnetic field surrounding the sensor-such as when a steel weapon passes near it-will increase the resistance to the current and will be detected as an increase in voltage.

Portable magnetic sensors typically include multiple aluminum strips that alternate diagonally across the sensor. The new zigzag sensors are expected to produce clearer signals (less electronic "noise") by confining the current to the center of the device and by eliminating edge imperfections that can result in nanoscale magnetic fluctuations.

The project is part of an interdisciplinary NIST effort to design nanoscale sensors with improved detection levels. NIST scientists experimented with sensor width, length and other dimensions to achieve the desired performance. Engineering of the sensors was supported by theoretical work using NIST-developed imaging and modeling tools.


Contact: Laura Ost, <laura.ost@nist.gov>, (301) 975-4034
MICROCHIP INDUSTRY STRIVES TO PERFECT ITS TIMING

Time is money, especially to the semiconductor industry. Electronics manufacturers use extremely sophisticated equipment to churn out the latest microchips, but they have a timing problem. It's very difficult to get all the fabrication tools in a manufacturing line to agree on the time. Components within a single tool can disagree on the time by as much as two minutes, because of a lack of synchronization.

According to a new report by the NIST and International SEMATECH,* the timing deficiencies will become important as device dimensions and tolerances continue to shrink. In particular, timing becomes critical as firms advance e-manufacturing concepts such as real-time automation and intelligent control.

Tools can be synchronized to about 100 millisecond (ms) accuracies today, but with significant variations. The problems are myriad, according to the report. For instance, subsystems made by suppliers may lack the interfaces needed to synchronize their clocks with host clocks made by original equipment manufacturers. Quality control software that relies on time stamps to diagnose processing errors may overload the computing resources of fabrication systems, therefore degrading the time stamp accuracy. There also is pressure to move forward: Methods are available to reach 1 ms accuracy in the near future, but sub-millisecond accuracies will be required eventually.

To help achieve that level of precision, NIST is leveraging its time-keeping expertise to support the industry's development of time synchronization standards in collaboration with International SEMATECH's e-Manufacturing initiatives. A next-generation time synchronization protocol under development by the Institute of Electrical and Electronics Engineers should improve the outlook, and NIST has developed educational presentations and white papers to summarize the key issues and potential solutions. In addition, NIST plans to facilitate future standards development, possibly under a new Time Synchronization Working Group, chartered by Semiconductor Equipment Materials International.


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IDENTIFYING TOP QUALITY CD AND DVD MEDIA FOR ARCHIVING

Will your medical or bank records stored on CD or DVD still be retrievable 10 or 20 years from now? The answer depends on how well this type of media are cared for and on specific manufacturing processes used, according to a study* by researchers at the NIST.

Knowing that CDs and DVDs will work reliably for a certain number of years is critical to government agencies, hospitals, banks and other organizations that store massive amounts of vital data on optical discs.

As part of a long-term project with the Library of Congress (LOC), NIST researchers tested how well recordable optical disks made with different manufacturing processes held up when exposed to high temperatures, humidity and light levels. They found that some disks performed better than others and that excessive exposure to any of these conditions can accelerate the deterioration. Crucially however, they found that some disks can be expected to reliably store data for decades.

The question is how can those high-quality media be identified for archival applications. To address this issue, NIST, along with the DVD Association (DVDA) and several government agencies, has formed the Government Information Preservation Working Group. This group is working with the optical disk industry to set requirements for archival quality CD and DVD recordable media and to specify to the industry the minimum number of years that recordable CDs and DVDs need to last to meet their requirements. NIST researchers also are developing a test that media manufacturers can use to determine whether the CDs and DVDs meet the criteria for archival use. Other federal agencies as well as industry organizations are invited to join this effort and can contact the group at <gipwog@nist.gov>.


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FOUR ORGANIZATIONS RECEIVE PRESIDENTIAL QUALITY AWARD

The 2004 Baldrige Award recipients are: The Bama Companies, Tulsa, Okla. (manufacturing category); Texas Nameplate Company, Inc., Dallas, Texas (small business category); Kenneth W. Monfort College of Business, Greeley, Colo. (education category); and Robert Wood Johnson University Hospital Hamilton, Hamilton, N.J. (health care category). This is the second time that Texas Nameplate has been named a recipient of the Baldrige Award; the first time was in 1998. Baldrige Award recipients can reapply for the award after five years.

Improvement highlights from these four organizations include:

- While the overall frozen baked goods industry has remained relatively flat since 1999, Bama's sales have increased 47 percent and its profit margins have improved 19 percent.

- Texas Nameplate has cross-trained more than 80 percent of its 39 employees to perform multiple jobs across departments.

- Student performance at Monfort College of Business consistently has been well above the national mean and in 2003-2004 reached the top 10 percent level.

- In 1998, Robert Wood Johnson University Hospital implemented the "15/30" program which guarantees that patients coming into the emergency department will see a nurse within 15 minutes and a physician within 30 minutes.
Named after the 26th Secretary of Commerce, the Malcolm Baldrige National Quality Award was established by Congress in 1987 to promote excellence in organizational performance, recognize the quality and performance achievements of U.S. organizations, and publicize successful performance strategies. The Award is managed by NIST in conjunction with the private-sector.


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NEW PROJECT TAKES MEASURE OF PLASTIC ELECTRONICS

In the future, the phrase "smarty pants" might be taken quite literally, referring to trousers embedded with electronic "intelligence" so that they change color, for example, in response to their surroundings.

The timing of this vernacular twist will depend on when plastic "chips" become practical; so cheap and reliable that electronic circuits can be printed not only on clothing but also on paper, billboards and nearly anything else. Unlike today's largely silicon-based technologies, organic (carbon-based) materials are flexible, can be processed at low temperatures and lend themselves to large-area applications, such as wall-sized electronic murals.

Before the emerging field of organic electronics can deliver on its commercial promise, however, new measurements and processing capabilities must be developed. Creating many of the requisite tools is the aim of a new five-year research effort at the NIST.

"Organic electronics is at a stage akin to the very early days of the silicon semiconductor industry," explains NIST polymer scientist Eric Lin. "Lack of validated diagnostic probes and standardized test and measurement methods is an impediment to progress."

Unfortunately, the job of filling this void is especially challenging. The range of potential materials for organic electronics—from polymers to nanocomposites—is enormous. The number of synthesis and processing methods under consideration is also daunting. Examples include ink-jet printing, roll-to-roll printing, and various ways to coax molecules to self-assemble into components.

Accurate, reliable measurements will help solve current manufacturing issues and speed widespread use of the new microchips. Ultimately, says Lin, NIST plans to develop an "integrated measurement platform." The envisioned tool will allow scientists and engineers to predict the performance of organic electronic devices based on composition, structure and materials properties.

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CAUTION URGED FOR SWITCH TO INTERNET PHONES

Federal agencies and other organizations that are considering switching their telephone systems to Voice Over Internet Protocol (VOIP) should proceed with caution and carefully consider the security risks, says a recent report by the NIST.

VOIP is an important emerging technology that makes it possible to place telephone calls using a broadband Internet connection rather than traditional, circuit-based telephone lines. While it shows promise for lower cost and greater flexibility, VOIP has a very different architecture than circuit-switched telephony, and these differences result in significant security issues. "Administrators may mistakenly assume that since digitized voice travels in packets, they can simply plug VOIP components into their already-secured networks and remain secure. However, the process is not that simple," says the NIST report. Implementing common security measures into VOIP, such as firewalls and encryption, can cause poor voice quality and blocked calls if not done carefully and with the proper equipment. Designing, deploying and securely operating a VOIP network is a complex effort that requires careful preparation, says the report.

NIST recommendations to help in the transition to secure VOIP include: develop appropriate network architecture, including separate voice and data networks where feasible and practical; ensure that the organization can manage and mitigate risks to their information system operations, and continuity of essential operations when deploying VOIP systems; use and routinely test the security features included in VOIP systems; update VOIP software regularly and frequently; and, since worms, viruses and other malicious software are common on PCs connected to the Internet, do not use "softphone" systems that implement VOIP using a PC with a headset and special software.


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LASER APPLICATIONS HEAT UP FOR CARBON NANOTUBES

Carbon nanotubes—a hot nanotechnology with many potential uses—may find one of its quickest applications in the next generation of standards for optical power measurements, which are essential for laser systems used in manufacturing, medicine, communications, lithography, space-based sensors and other technologies.

As described in a forthcoming paper in Applied Optics,* scientists at the NIST and the National Renewable Energy Laboratory have made prototype pyroelectric detectors coated with carbon nanotubes. Pyroelectric detectors and other thermal detectors are the basis for all primary standards used to ensure that laser power and energy measurements are traceable to fundamental units. The coating absorbs laser light and converts it to heat, which is conducted to a detector underneath made of pyroelectric material. The detector's rise in temperature generates a current, which is measured to determine the power of the laser.
Carbon nanotubes - tiny cylinders made of carbon atoms - conduct heat hundreds of times better than today's detector coating materials. Nanotubes are also resistant to laser damage and, because of their texture and crystal properties, absorb light efficiently. Scientists hope that the nanotubes' resistance to aging and hardening will allow them to extend the range of NIST laser power standards to ultraviolet wavelengths, which would support the development and calibration of sensors for detecting chemical and biological weapons. The research also may contribute to the use of carbon nanotubes in fuel cells.

As described in the paper, the NIST-led research team was first to demonstrate the use of an airbrush technique to apply carbon nanotubes to a thermal detector. The team also will report, at a workshop on carbon nanotubes at NIST Jan. 26-28, growing multiwalled nanotubes directly on detectors with a chemical vapor deposition process. The team is now measuring the optical and thermal properties of various tube compositions and topologies, using an unusual approach that is much faster than conventional methods.


Contact: Laura Ost, <laura.ost@nist.gov>, (301) 975-4034

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QUICK LINKS

Experts Urge Redefinition Of The Kilogram. It's time to replace the 115-year-old kilogram artifact as the world's official standard for mass, even though experiments generally thought necessary to achieve this goal have not yet reached their targeted level of precision. That's the conclusion of an upcoming Metrologia journal article authored by five eminent scientists from the United States, United Kingdom and France that was discussed at a scientific meeting of the Royal Society of London on Feb. 14-15.

Baldrige 2005 Criteria Now Available. The 2005 criteria used by businesses to apply for the Malcolm Baldrige National Quality Award are now available; editions for education and health care will be available soon. The Baldrige Performance Excellence Criteria are also used by thousands of organizations to assess and improve their performance in a wide range of areas including leadership, governance and ethics, employee and customer relations, and results. Also available is a worksheet that organizations can use in conjunction with the criteria to do a simple self-analysis. The worksheet can help identify an organization's strengths and opportunities for improvement and establish goals and action plans. The criteria and the worksheet are available at <http://www.baldrige.nist.gov> or by calling (301) 975-2036.

Wanted: Expert Reviewers for 2005 Baldrige Award. Each year the Baldrige National Quality Program recruits experts from business, education, health care and other fields to serve as members of the board of examiners for the Malcolm Baldrige National Quality Award. Examiners evaluate applications for the award and prepare feedback reports to applicants citing strengths and opportunities for improvement.

The board consists of more than 500 members, including nine judges and about 60 senior examiners representing many industries, companies and organizations, including those from not-for-profit and public sectors. For the 2005 board, NIST is particularly looking for applicants who are physicians and those with experience in financial, food manufacturing, utilities and not-for-profit sectors. Service on the board provides an opportunity to enhance a board member's knowledge, to develop a new network of expert colleagues and to help improve U.S. competitiveness. Applications for the board are available at <http://baldrige.nist.gov/Examiner_Application.htm> or by calling (301) 975-2036.

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President’s Message (continued from page 3)

Other Topics - Other topics included NIST - NCSLI communication, NIST measurement services, and NCSLI National Measurement Requirements Report.

Conclusion

It does not seem possible that the first quarter of my term of president is completed. We have a lot that we want to accomplish this year and it never seems like we have enough time. I would like to let you know that Tony Anderson is still working with ILAC as the Chair of the Laboratory Committee. Please read his report (page 20) to keep up to date on the actions taken by ILAC. In addition Malcolm Smith has traveled to Europe to meet with EUROMET and EUROLAB to further develop the working relations between NCSLI and those organizations. Malcolm has also been coordinating activities with SIM.

The next Board of Directors meeting will be held in Boulder, CO April 24 - 27, 2005. We welcome ANY member delegate to attend our Board meetings, so if you can get to Boulder, please come. You will have a chance to visit the NCSLI Office, meet with the NCSLI staff, plus participate in the Board of Director meeting.

Harry J. Moody
NCSLI President
3rd INTL CONFERENCE ON METROLOGY
(Long Range Planning)
Tel Aviv, Israel
November 14-16, 2006

Theme: Trends and Applications in Calibration and Testing Laboratories

Organized by the National Conference of Standard Laboratories - International (NCSLI), Co-operation on International Traceability in Analytical Chemistry (CITAC) and the Israeli Metrological Society (IMS) in conjunction with the 16th International Conference of the Israel Society for Quality

Organizing Committee:
Ilya Kuselman, Israel
Prof. Hüseyin Uğur, Turkey
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INTERNATIONAL MEASUREMENT CONFEDERATION (IMEKO)

Chester Franklin, Liaison Delegate

XVIII IMEKO World Congress
(Metrology for a Sustainable Development).
Sept 17-22, 2006
Rio de Janeiro - BRAZIL
Organized by the Brazilian Society of Metrology
Technical Support provided by NCSLI-International
The official event of the International Measurement Confederation (IMEKO)
Information on: <http://www.metrologia2006.org.br/>
And <http://www.imeko.org/>

As you probably know, I am responsible for the organization of the XVIII IMEKO World Congress in 2006. To avoid overlap with other important events, the date was shifted from May 7-12, 2006 to Sept 17-22, 2006, which is the correct date now.
Submitted by Maurice Froto

RUSSIAN TRANSLATION OF RP-14
Ed Nemiroff

A new Russian Translation of RP-14 was produced by the Central Asian Cooperation on Metrology, Accreditation and Standardization (CAC-MAS-Q) -NCSLI Region 6000.

Here is the procedure that we used to insure an accurate translation. The initial translation was performed by our USAID project through the office of the Secretariat of the CAC-MAS-Q. The Secretariat formally coordinated the review process between the National Metrology Institutes here in Central Asia - (Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan). Each of the NMI's reviewed, provided comments and recommendations. After all comments and recommendation were completed, a final draft version was produced and circulated to the NMI's for final approval.

You will see that the attached document intro-page indicates that the translated version was reviewed and approved by all for NMI's. We hope that this will become an official NCSLI version of the RP. It is our intention to translate other RP's.

Guide to Selecting
Standards-Laboratory Environments

Recommended Practice
RP-14
March 1999
Prepared by:
NCSLI International
©National Conference of Standards Laboratories 1999
All Rights Reserved
The Scope of Recognition of L-A-B is:

For Testing -

- Mechanical Testing including environmental simulation such as CASS, salt spray, vibration, shock, durability
- Dimensional Measurement including CMMs

For Calibration -

- Mass - Scales, Balances
- Pressure
- Torque
- Force
- Hardness
- Length

Editor's Note: See page 51 for the A2LA and L-A-B agreement.

Committee News (continued from page 40)

The International Event will be held on the Dandy dinner boat, with a cruise on the Potomac River. The Galileo Players will be entertaining banquet attendees on Tuesday night. They are a scientific comedy company which will cater its program to the interests of its audience.

There are four new members on the conference committee: Chet Franklin, Harry Spinks, Charlie Fallon, and Steve Doty. There has also been informal help from NIST with Sally Bruce and Barbara Belzer both assisting in finding an international event venue and from Georgia Harris in setting up the NIST tours.

Future Conferences

The 2006 Conference will be in Nashville. Exhibit booth space is already being sold for this event. For the 2006 conference, speakers who submit a manuscript by the deadline will pay a reduced registration fee of $200 for the conference. All other speakers will pay the early bird rate - as they do now - if they do not submit a manuscript by the deadline. Call for Papers for 2006 will be issued sometime in April.

The 2007 Conference will be in St. Paul, Minnesota. Conference Director for 2007 is Harry Spinks, of Boston Scientific.
LIAISON NEWS

ASIA PACIFIC LABORATORY ACCREDITATION COOPERATION (APLAC)

Peter Unger

APLAC Multilateral Mutual Recognition Arrangement

The list of signatories to the APLAC MRA is provided below.

APLAC General Assembly

The annual general meeting of the Asia Pacific Laboratory Accreditation Cooperation (APLAC) and its associated committee meetings were held in Hanoi, Vietnam, 5-10 December. The meetings involved about 80 people from 18 economies. I chaired my final APLAC General Assembly meeting.

The move toward incorporation of APLAC was endorsed. A workshop to develop an MRA for the accreditation of reference materials producers was endorsed. MRA peer evaluation training on ISO/IEC 17011 was scheduled for April, 2005.

APLAC MRA Council

The APLAC MRA Council met twice last year (Columbia, MD in April and Hanoi in December).

The list of signatories to the APLAC multi-lateral Mutual Recognition Arrangement (MRA) is provided on the last page as an attachment. There are twenty signatories to the APLAC MRA.

New Members of the Board of Management of APLAC

The following officers were elected to the APLAC Board of Management for 2005:

Chair: Tony Russell (NATA, Australia)

Officers: Jeffrey Horlick (NVLAP, USA)
Terence S S Chan (HKAS, Hong Kong)
Katuo Seta, (IAJapan, Japan)
Chang Kwei Fern (SAC, Singapore)
Wei Hao (CNAL, China)

MRA Council Chair: Terence Chan (HKAS, Hong Kong)

Immediate Past Chair: Peter Unger (A2LA, USA)

The contact details for the APLAC secretariat are:
Dr Helen Liddy, APLAC Secretary
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North Melbourne VIC 3051
AUSTRALIA
Telephone: +61 3 9329 1633;
Facsimile: +61 3 9326 5148;
E-mail: <aplac@nata.asn.au>

APLAC PARTIES TO THE APLAC MRA

<table>
<thead>
<tr>
<th>Organization</th>
<th>Acronym</th>
<th>Area/s Included</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Association of Testing Authorities, Australia</td>
<td>NATA</td>
<td>Testing/Calibration; Inspection</td>
</tr>
<tr>
<td>Standards Council of Canada/Conseil canadien des normes</td>
<td>SCC</td>
<td>Testing/Calibration</td>
</tr>
<tr>
<td>China National Accreditation Board for Laboratories</td>
<td>CNAL</td>
<td>Testing/Calibration; Inspection</td>
</tr>
<tr>
<td>Hong Kong Accreditation Service</td>
<td>HKAS</td>
<td>Testing/Calibration; Inspection</td>
</tr>
<tr>
<td>National Accreditation Board for Testing and Calibration Laboratories, India</td>
<td>NABL</td>
<td>Testing/Calibration</td>
</tr>
<tr>
<td>Komite Akreditasi Nasional, Indonesia</td>
<td>KAN</td>
<td>Testing/Calibration; Inspection</td>
</tr>
<tr>
<td>Japan Accreditation Board for Conformity Assessment</td>
<td>JAB</td>
<td>Testing/Calibration</td>
</tr>
<tr>
<td>International Accreditation Japan (IAJapan)</td>
<td>IAJapan</td>
<td>JCSS</td>
</tr>
<tr>
<td>JVNL</td>
<td>ASNITE Testing</td>
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<td>ASNITE Calibration</td>
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<tr>
<td>KOLAS</td>
<td>Testing</td>
<td></td>
</tr>
<tr>
<td>DSM</td>
<td>Testing/Calibration</td>
<td></td>
</tr>
<tr>
<td>IANZ</td>
<td>Testing/Calibration; Inspection</td>
<td></td>
</tr>
<tr>
<td>SAC</td>
<td>Testing/Calibration; Inspection</td>
<td></td>
</tr>
<tr>
<td>CNLA</td>
<td>Testing/Calibration</td>
<td></td>
</tr>
<tr>
<td>TLAS</td>
<td>Testing/Calibration</td>
<td></td>
</tr>
<tr>
<td>DMSc</td>
<td>Testing</td>
<td></td>
</tr>
<tr>
<td>A2LA</td>
<td>Testing/Calibration</td>
<td></td>
</tr>
<tr>
<td>IAS</td>
<td>Testing/ Inspection; Inspection</td>
<td></td>
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<tr>
<td>NVLAP</td>
<td>Testing/Calibration</td>
<td></td>
</tr>
<tr>
<td>BoA</td>
<td>Testing/Calibration; Inspection</td>
<td></td>
</tr>
</tbody>
</table>

Voluntary EMC Laboratory Accreditation Center, Japan
Korea Laboratory Accreditation Scheme
Department of Standards, Malaysia
International Accreditation New Zealand
Singapore Accreditation Council
Chinese National Laboratory Accreditation
Thai Laboratory Accreditation Scheme
Department of Medical Sciences, Thailand
American Association for Laboratory Accreditation, USA
International Accreditation Service, Inc., USA
National Voluntary Laboratory Accreditation Program, USA
Bureau of Accreditation, Vietnam
APLAC Publications

APLAC documents and membership lists are available as PDF files from the APLAC web site: <www.aplac.org>. "APLAC News Notes", published bi-monthly, is available only by electronic distribution (as a PDF) and via the APLAC web site.

APEC Funded Projects

The Asia Pacific Economic Cooperation (APEC) has funded the first phases of projects, namely surveys of APLAC members to identify 6 calibration and 15 testing proficiency testing programs to be run over 3 years. Also, a 5-day training course on ISO/IEC Guide 43 on proficiency testing programs, was also held in Sydney, Australia in February.

Future APLAC Meetings

APLAC General Assembly and associated meetings
13-18 November 2005
Chiang Mai, Thailand

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AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION (A2LA)
Dana S. Leaman, Liaison Delegate

A2LA Attends the APLAC General Meeting

The Asia Pacific Laboratory Accreditation Cooperation (APLAC) General Meeting was held December 5 - 10, 2004 in Hanoi, Vietnam. Peter Unger, President, Roxanne Robinson, Vice President, and Trace McInturff, Operations Manager represented A2LA. As the APLAC Chairman, Peter Unger presided over the meeting which included the recognition of three accreditation bodies who have expanded their scopes of recognition into the calibration field under the Mutual Recognition Arrangement (MRA). These were DSM Malaysia, KAN Indonesia, and BOA Vietnam. The APLAC Board of Management for 2005 was also elected. Peter Unger will serve as Immediate Past Chair.

The ILAC General Meeting held in Cape Town, South Africa

On October 5, 2004, the International Laboratory Accreditation Cooperation (ILAC) began its annual General Meeting in Cape Town, South Africa. In attendance from A2LA were Peter Unger, President, Roxanne Robinson, Vice President, and Daren Valentine, Communications Manager. Among the highlights of the meeting, a two-year transition period was established for the implementation of 17025:2005. The publication of this document is expected in April 2005.

ISO/IEC 17011:2004, which replaces Guide 58 for bodies operating an accreditation program, was also discussed. The ILAC MRA signatory accreditation bodies will be required to comply with this document by January 1, 2006. A2LA has reviewed its current programs and is confident that the system currently in place addresses the requirements of ISO/IEC 17011. Also, the ILAC Executive Committee for 2005-2006 was elected and Peter Unger will serve as the Vice Chairman.

Philip Smith joins A2LA

A2LA welcomes Philip Smith to staff as the Business Development Manager. Phil comes to A2LA from an independent distributor/importer of electronic components and subassemblies. Since 2000, Phil has also worked as a contracted technical assessor for A2LA. His technical knowledge as well as his knowledge regarding accreditation will certainly be a benefit in the continuous promotion of accreditation activities around the globe for our A2LA accredited laboratories.

A2LA Recognition following withdrawal from the NACLA MRA

The A2LA Board of Directors decided to end A2LA’s signatory status within the current NACLA Mutual Recognition Arrangement (MRA) as of December 31, 2004. Recent events regretfully necessitated this decision. These events include NACLA's disappointing lack of enforcement of the NACLA MRA obligations, such that it achieves the purposes and goals for which MRAs are established around the world.

A2LA remains a signatory to all other MRAs, including ILAC (global), EA, APLAC and IAAC. A2LA made very sure that our international MRAs would support our accredited laboratories and that the acceptance of our laboratories' accredited test and calibration data by regulators and specifiers would in no way be threatened by our withdrawal from NACLA.

A2LA recognizes L-A-B

A2LA remains committed to relieving our accredited laboratories of the burden of duplicative accreditations, and we support any positive steps toward the achievement of this goal. We fully support and will abide by the obligations of the MRAs of which we are a signatory. To this point, A2LA is recognizing the test reports and calibration certificates produced by the Laboratory Accreditation Bureau LLC (L-A-B)'s accredited laboratories whose testing or calibration work falls under LAB's NACLA Scope of Recognition <www.nacla.net/scopes/lab>. A2LA has the necessary confidence in the competence of the LAB's accreditation for the programs on the NACLA Scope of Recognition. Because of this confidence A2LA is recognizing L-A-B even though A2LA is no longer a NACLA Signatory. A2LA and L-A-B intend to sign a formal bilateral recognition agreement in the very near future. Additionally, A2LA is presently working to establish bilateral recognition agreements with the other NACLA signatories who support the goals of the MRA.

Further information regarding A2LA’s continued recognition can be found in our February 2005 Newsletter located on the A2LA website, <www.a2la.org>.

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AMERICAN PHYSICAL SOCIETY
Klaus Jaeger, Liaison Delegate

The largest annual meeting of the American Physical Society (APS) was held in Los Angeles, CA, with about 6000 attendees. The complementary meeting in April is scheduled for April 16-19, 2005 in Tampa, FL.
In the year 2004 the APS conducted a physics haiku contest. The winner was announced in the November 2004 APS News as Celia Elliott with two entries:

**Hubris**
Theoretical Physicist am I. Mortals tremble before me.

**Irresistible Force**
Tripped. Fell on my ass. Awesome demonstration of F=ma.

The International Union of Pure and Applied Physics has declared the year 2005 as the World Year of Physics (WYP 2005). This is in honor of Albert Einstein's 100th anniversary "miraculous year" of publications. The U.S. efforts are spearheaded by the American Physical Society (APS), the American Association of Physics Teachers (AAPT), and the American Institute of Physics (AIP). The US theme is "Einstein in the 21st Century" and special events are scheduled throughout the year. Please check the respective websites for specific information.

Prior to the year 1905, Albert Einstein published 5 papers on thermodynamics including statistical mechanics. In the year 1905, he published 26 papers and comments (Beiblätter), mostly in the Annalen für Physik! Among these 26 publications were three (3) that stood out in terms of significance.

1. Light quanta: "On a Heuristic Point of View Concerning the Production and Transformation of Light." In this paper, Einstein sets forth the revolutionary theory that at sufficiently high frequencies, light behaves like quanta (particles) with energies proportional to the frequency E=h/\omega with h being Planck's constant. In 1921, Einstein received the Nobel Prize in physics "for his services to theoretical physics and especially for his discovery of the photoelectric effect".

2. Brownian Motion: "On the Movement of Small Particles Suspended in Stationary Liquids Required by the Molecular-Kinetic Theory of Heat." This paper was preceded by several papers on molecular dimensions and continued with several additional papers in the following 4 years.

3. Special Relativity: "On the Electrodynamics of Moving Bodies." This paper describes special relativity with papers on General Relativity coming many years later. Aside from Isaac Newton's formula F=ma, the second most recognized formula in physics is E=mc², which was first derived by Einstein in a paper in 1905 with the title "On the Inertia of Energy Required by the Relativity Principle".

To familiarize the younger generation of our memberships of the importance of Albert Einstein's contribution to physics in the 20th Century, and also to remind all of us that such an icon is just a Mensch (human being), I assembled a short biography.

Editor's Note: Due to space issues, I have had to leave out Klaus's compendium on Einstein's life. It is quite interesting. Please request a copy from Klaus at <jaegerenterprise@Comcast.net> or Editor.

**INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE) INSTRUMENTATION & MEASUREMENTS SOCIETY (I & M)**

David Braudaway, Liaison Delegate

The 2004 Joseph F. Keithley Award

The 2004 Joseph F. Keithley Award recipient is Clark A. Hamilton for development of the Josephson Junction Array Voltage Standard. The award is presented at a meeting selected by the recipient; the 2005 NCSLI Symposium was the selected event. The Honorarium for this award is $10,000. The first Joseph F. Keithley Award was presented at IMTC 2004 in Como, Italy, to Henry Hall for his work on Bridge Development.

The IEEE I&M Society

The IEEE I&M Society has a number of conferences and workshops scheduled for the following year. The Instrumentation and Measurements Technology Conference, IMTC, in Ottawa, is the principal conference. Also of long standing is AUTOTESTCON, in Orlando Florida. The other conferences and workshops are among those being developed. Listed are WEB and e-mail contacts for these events.

Upcoming Conferences And Workshops Are:

13 May 2005/ Workshop on Advanced Methods for Uncertainty Estimation in Measurement, Sheraton Fallsview Hotel and Conference Centre, Niagara Falls, Ont. Canada. Contact Alessandro Ferrero at <alessandro.ferrero@polimi.it>

17-19 May 2005/ 22nd IEEE IMTC Instrumentation and Measurement Technology Conference, Ottawa, ON, Canada. Contact: Bob Myers at <bob.myers@ieee.org> or <http://www.ieee-imtc.org>

26-29 September 2005/ AUTOTESTCON'05 Orlando, FL USA. Contact Steve Karlovic <steve.karlovic@lmco.com>

*********

**AMERICAN SOCIETY FOR QUALITY (ASQ)**

Christopher L. Grachanen, Liaison Delegate

ASQ Measurement Quality Division (MQD) - The Standard

MQD's quarterly publication, The Standard, will now be offered electronically in PDF format via the MQD website. The MQD website is at: <http://www.asq.org/measure>. NCSLI's own Jay Bucher (Madison Wisconsin regional coordinator) is The Standard's new editor in chief. The Standard contains information about MQD activities, CCT program updates, standards committee news, Metrology education and training as well as articles of general interest to the measurement community.

NCSLI and ASQ MQD partner on Metrology Job Description Initiative

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NCSLI, in partnership with ASQ MQD, will be focusing efforts on creating accurate job descriptions for Calibration Technicians, Calibration Engineers and Metrologists for the U.S. Department of Labor, Bureau of Labor Statistics. This important initiative is a wonderful opportunity for NCSLI and ASQ MQD to collaborate on a project impacting the U.S. measurement community. To learn more about the Metrology Job Description Initiative please visit the Educator's Corner in this issue of the newsletter, page xxx.

Certified Calibration Technician (CCT) Program Update

As of this writing (February 2005), the CCT alumni have grown to 348 individuals. Congratulations go out to DEC '04 grads!

<table>
<thead>
<tr>
<th>Date of Exam</th>
<th>Took Exam</th>
<th>Passed Exam</th>
<th>% Passed</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 7, 2003 (Pilot)</td>
<td>97</td>
<td>69</td>
<td>71%</td>
</tr>
<tr>
<td>December 6, 2003</td>
<td>107</td>
<td>69</td>
<td>65%</td>
</tr>
<tr>
<td>May 23, 2004 (AQC)</td>
<td>4</td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>June 5, 2004</td>
<td>133</td>
<td>102</td>
<td>77%</td>
</tr>
<tr>
<td>December 4, 2004</td>
<td>139</td>
<td>104</td>
<td>75%</td>
</tr>
</tbody>
</table>

There was a CCT Item Review workshop held on February 18-19, 2005 at ASQ headquarters in Milwaukee, WI. This workshop focused on test items for the June 2005 & Dec 2005 CCT exams. An Item Review workshop consists of volunteer committee members (CCT graduates) who review test items for accuracy, consistency, non-interdependence with other test items, plausibility of answer choices and reference traceability to published documents available in the public domain.

Prior to coming to the workshop, committee members "take" a pilot exam just as a candidate would. These participants are asked to comment on test items and send them to the ASQ Test Developer who compiles them for the workshop. At the workshop, the committee members are trained in a variety of assessment issues and then asked to focus on items identified as 'problematic' from the pilot exam. After all the issues in the pilot exam are resolved, the committee then approves test items for future use in CCT exam offerings.

The 2005 schedule for CCT exam offering is:

<table>
<thead>
<tr>
<th>Exam Date</th>
<th>Application Deadline</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 15, 2005</td>
<td>April 1, 2005</td>
<td>Seattle, WA</td>
</tr>
<tr>
<td>World Conference on Quality and Improvement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>June 4, 2005</td>
<td>April 1, 2005</td>
<td>ASQ Local Sections and International Sites</td>
</tr>
<tr>
<td>December 3, 2005</td>
<td>October 7, 2005</td>
<td>ASQ Local Sections and International Sites</td>
</tr>
</tbody>
</table>

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ISA INTERNATIONAL
Mike Suraci, Liaison Delegate

I have engaged in several communications with Past ISA President Walt Bajek and current ISA Executive Director, Rob Renner, on determining the ISA rationale for discontinuing their Liaison with IMEKO.

Additional communications have been maintained with staff at ISA. The parallel activities of the 2 organizations present opportunities to share experiences.

Areas discussed have included:

Long term Conference planning

Web site activities

Training opportunities

Headquarters requirements

Publications

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COUNCIL FOR OPTICAL RADIATION MEASUREMENT (CORM)
Sally Bruce, Liaison Delegate

The Council for Optical Radiation Measurement (CORM) annual conference is titled CORM 2005: Challenges in Radiometry and Photometry. The theme for this year's conference is: Identifying and Overcoming the Challenges facing Industry in the Measurement of Optical Radiation. The conference is being held May 10-12, 2005, at NIST in Boulder, CO

CORM 2005 presents an excellent opportunity for those active in all aspects of radiometry and photometry to both advance their knowledge and participate in the advancement of measurement capability, applications development, and standards. CORM 2005 brings industrial, academic and government professionals together to address the changing needs of industry.
**Opening Plenary Session: NIST's Role in the U.S. Measurement System**

Presentation topics include the following:

Detectors: Photon counting detector metrology and development efforts at NIST; Developments in the NIST Special Test for spatial uniformity of laser and optical fiber power meters for detectors used with lasers; Reflective chopper wheel in calibration of high-power laser detectors at NIST; Nonlinearity of response of silicon photodiodes at 193 nm; High-power nonlinearity of optical fiber power meters at 1474 nm; Carbon nanotube-based coatings for radiometry; Acousto-optic tunable filters for imaging and non-imaging optical measurement systems.

Sources: Broad spectrum capabilities for CW laser power measurements at NIST; NIST facility for spectral irradiance and radiance responsivity using uniform source (SIRCUS); A spectrally tunable light source for photometric and colorimetric calibrations; Single photon sources and entangled photon pairs sources; Metrology needs and applications; Spectral irradiance calibration of deuterium lamps using the NIST synchrotron, SURF II.

Solid State: Correction of stray light and fluorescence in sphere-spectroradiometer measurement systems; Solid-state calibration sources for ocean color (Remote sensing); Broadband radiometric measurement of LED devices.

Displays: Variable radius source method to separate specular component from haze peak; A color gamut assessment standard: An inter-laboratory measurement comparison; Challenges of using filter radiometers to determine product compliance to MIL-STD 3009; CCD-based colorimetry: Potential errors and solutions.

Display standards: Display Standards: ISO, VESA, SAE, IEC

Environment and Climate: Solar radiometric metrology for renewable energy applications; Determination of longwave response of shortwave solar radiometers; NREL participation in the DOE Atmospheric Radiation Measurement (ARM) Program.

For further information and registration visit the CORM website <http://www.corm.org>  

**MEASUREMENT SCIENCE CONFERENCE**

*Miguel Cerezo, Liaison Delegate*

This year's Measurement Science Conference was held at the Disneyland Hotel and Conference Center in Anaheim, CA during the third week of January 2005. The conference was extremely successful and well attended with over 950 attendees and 100+ exhibitors.

The first two days (Jan. 17 and 18) were devoted to NIST seminars and topics including:

- Experiment Design for Calibration and Interlaboratory Studies
- Mass Measurement - Intermediate Topics
- Estimating and Reporting Measurement Uncertainty
- NIST Flow Seminar
- Time and Frequency: Measurement and Applications

The Seminars were followed up with a series of Tutorial Workshops on January 19th. On the final two days of the Measurement Science Conference (January 20 and 21), attendees were treated to five distinct tracks in which papers and presentations related to a plethora of measurement science related topics were presented.

2006 promises to be another exciting year and preparations have already commenced. The conference theme will be "The Science, Technology and Control of Measurements." Once again, the conference will take place at the Disneyland Hotel. Anyone wishing to help craft next year's technical program can find information on the conference website at <www.msc-conf.com>.

One significant change from recent trends is the conference dates. Next year, the conference will be held during the week of February 27th - March 3rd, 2006. So please mark these dates on your calendar and we'll look forward to seeing you next year.
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2005 NCSLI INTERNATIONAL WORKSHOP & SYMPOSIUM
August 7-11, 2005
Washington, DC

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2005 Conference Director ................. Gary Jennings .............. (410) 993-5400 FAX (410) 993-5001
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Guest Program .......................... Tom Huttemann .............. (252) 763-1600 FAX (252) 255-1927
Publicity/Marketing ...................... Jesse Morse .............. (425) 446-5468 FAX (425) 446-5992
........................................ Jim Smith .............. (714) 856-1670 FAX (714) 896-5354
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Best Paper Selection ..................... Jeff Gust .............. (260) 244-7450 FAX (260) 244-7905
........................................ Doug Sugg .............. (909) 273-5380 FAX (909) 273-5500
Conference Evaluation ................. Larry Yates .............. (941) 429-4377 FAX (941) 429-4377
Entertainment .......................... Carol Hockert .............. (651) 215-5823 FAX (651) 639-4014
Door Prizes .............................. Mike Suraci .............. (206) 842-7321 FAX (206) 780-8157
Site Selection .......................... Tony Anderson .............. (407) 333-3327 FAX (407) 333-3309
VP Operations .......................... Tom Wunsch .............. (505) 844-4359 FAX (505) 844-7699
VP Education & Training ............... Georgia Harris .............. (301) 975-4014 FAX (301) 926-0647
2006 Conference Director ............... Edward Pritchard .............. (865) 574-4261 FAX (865) 574-2802
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NEWSLETTER EDITORIAL SCHEDULE FOR 2005-06

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EDITOR’S NOTE:
This schedule is for guidance for anyone who needs to submit material for publication in the Newsletter.

FUTURE CONFERENCES

2005 NCSL International Workshop & Symposium
August 7-11, 2005
Washington, DC

2006 NCSL International Workshop & Symposium
August 6-10, 2006
Nashville, TN

2007 NCSL International Workshop & Symposium
July 29-August 2, 2007
St. Paul, MN

Abstracts are required for Workshops, Panels, and Papers. For more information contact:
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BOARD OF DIRECTORS’ MEETING DATES

April 24-27, 2005
Residence Inn
Boulder, CO

August 7, 12-13, 2005
Washington Hilton & Towers
(in conjunction with the NCSL International Workshop & Symposium, August 7-11, 2005)

October 23-26, 2005
Radisson Plaza Hotel
Myrtle Beach, SC

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