Who are our customers?

It's a pleasure for me to be addressing this great organization for the first time. You can tell from my title that I feel strongly about this matter of customers.

Another way to ask this question might be: who benefits from what you do? Many companies ask themselves this question, and interestingly enough, the answer is not always totally clear. If you are an independent commercial calibration or testing lab your answer is easier; it is your customer base that purchases your services. If you are a captive lab, servicing a manufacturing facility, the manufacturing process personnel may be your final customer. If you are a research facility developing new ways to test for biohazards, your customer may be the newly-launched Homeland Security Agency. In all cases, it is vital to an organization to remember who its customers are and how to best know and service their needs.

(Continued on page 10)
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EDITOR'S MESSAGE

Reports from the Board

I've always tried to cluster all the dozens of reports for the newsletter into logical sections or chapters. Most are self-obvious; regions, committees, liaison, etc. But now we have a number of NMLS and others which have become important, as testified by new international appointments to our Board.

So, I have chosen to create a new masthead, "Reports from the Board," which will include the reports from NIST, INMS, CENAM, BIPM, SIM and ILAC/NACLA. This still leaves others for the liaison section.

I also try to edit out some of the redundancies, which happen because multiple people report on them. However, in the Region/Section reports, I tend to leave in repetitive stories, such as the identical road show team's presentation, because I believe that regions need to see what each other is doing, and creatively "appropriate" any good ideas they find elsewhere.

Continued on page 11
As Metrologists, Scientists, and Engineers, we can lose sight of where metrology often takes place. When many of us hear the word metrology, we think of the lab-coat-adorned scientist working in a state-of-the-art laboratory, performing what we sometimes call “black art” and attempting to measure what has never been measured. While this is metrology, we must remember that “the science of measurement” takes place at many levels and in many forms. For example, a technician calibrating a scale in a warehouse, a specially designed in-process gage used to control a machining line, or the analysis of wastewater to ensure that we are not impacting the environment - all of these involve the science of measurement.

The spectrum of metrology is very broad and encompasses a range of sciences, techniques, tools and levels of accuracy. One does not need to measure micrometers or at the parts-per-million level to perform metrology. In many instances, metrology that touches our everyday lives is the metrology that makes the final decision as to whether the product meets our requirements. At the end of the day, metrology covers a continuum of measurements performed from the highest-level laboratories to the gasoline pump, and each level presents unique challenges and rewards.

The 2003 Conference is intended to provide a forum for those involved across the entire spectrum of metrology and will provide a unique opportunity to network with other measurement professionals.

Papers, Panels & Workshops:

The Workshop & Symposium offers papers, panels, and workshops that explore this year’s Conference theme, and are organized into the following five categories:

- Theoretical
- Applied
- Management
- International
- Quality

Exhibits:

Meet with key executives and leading technical experts from over 150 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:

As in past years, the 2003 Conference will include a series of tutorials presented before and after the conference. Topics are not yet finalized, but will be similar to those presented in the past.

Please join us in Tampa, Florida prepared to learn, to teach, and to develop new professional relationships with your fellow “Metrologists”.

For more information, go to www.ncsli.org/conference/2003/
High-Capacity Mass Dissemination with Four-Place Mass Comparator

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Abstract

After briefly introducing the basic elements of mass dissemination, the requirements of high-capacity mass dissemination to calibrate weights and weight sets in the nominal range of a few kilograms up to 60 kg are discussed. A new mass comparator dedicated to high-capacity mass calibration is delineated. It features a four-place turntable for automatic weight exchange, a set of substitution weights, and means to control the calibration and to collect the measurement data.

Actual measurement results of this comparator are presented, and a few typical applications are commented. These comprise high-accuracy calibration of mass standards, calibration of large objects, calibration of disc weights of force standard machines or primary pressure balances, and high-accuracy volume determination.

Introduction

The calibration of weights and weight sets (also referred to as dissemination) is an essential step in providing traceability to the mass scale. To build a comprehensive mass scale, mass standards beyond the kilogram, the unit of mass, must be provided. Equipment to perform the required operations, namely, mass comparators, is readily available for calibration of weights and their multiples to 1 milligram. Calibrations are carried out manually when lower accuracy or lower throughput is satisfactory. For weights of higher accuracy classes, and for higher efficiency performance, automatic comparators are preferred.

Comparators for mass standards heavier than one kilogram are also available. However, calibration equipment for weights above 20 kg is far from being ubiquitous, especially for high-accuracy classes and for automatic operation. Therefore, many calibration laboratories and national metrology institutes have built their own proprietary equipment.

Recently, a high-capacity, high-resolution mass comparator, equipped with an automatic four-place weight exchanger, has become commercially available. This mass comparator not only extends the range of automatic calibration of weights and weight sets beyond 60 kg, but also provides unprecedented comparison accuracy.

Mass Scale

A mass scale is established by weights (mass standards). Besides their nominal mass, these standards are distinguished by various accuracy classes. For example, OIML defines mass standards in the range from milligrams to tons in nominal steps of 1 kg.

Table 1 lists the maximum permissible error (mpe) of the four top accuracy classes of weights according to OIML R 111 and ASTM E 617.

Table 1: Maximum permissible errors (mpe) of the four most accurate OIML and ASTM weight classes according to OIML R 111 [3] and ASTM E 617 [5].

<table>
<thead>
<tr>
<th>Accuracy Class</th>
<th>OIML: E1</th>
<th>E2</th>
<th>F1</th>
<th>F2</th>
<th>ASTM: 0 1 2 3 Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>mpe, relative</td>
<td>0.5</td>
<td>1.5</td>
<td>5</td>
<td>15</td>
<td>1.3</td>
</tr>
<tr>
<td>mpe for nominal mass of</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 kg</td>
<td>0.5</td>
<td>1.5</td>
<td>5</td>
<td>15</td>
<td>1.3</td>
</tr>
<tr>
<td>2 kg</td>
<td>1</td>
<td>3</td>
<td>10</td>
<td>30</td>
<td>2.5</td>
</tr>
<tr>
<td>3 kg</td>
<td>2.5</td>
<td>7.5</td>
<td>25</td>
<td>75</td>
<td>3.8</td>
</tr>
<tr>
<td>5 kg</td>
<td>5</td>
<td>15</td>
<td>50</td>
<td>150</td>
<td>6</td>
</tr>
<tr>
<td>10 kg</td>
<td>5</td>
<td>15</td>
<td>50</td>
<td>150</td>
<td>13</td>
</tr>
<tr>
<td>20 kg</td>
<td>10</td>
<td>30</td>
<td>100</td>
<td>300</td>
<td>25</td>
</tr>
<tr>
<td>25 kg</td>
<td>10</td>
<td>30</td>
<td>100</td>
<td>300</td>
<td>31</td>
</tr>
<tr>
<td>30 kg</td>
<td>10</td>
<td>30</td>
<td>100</td>
<td>300</td>
<td>38</td>
</tr>
<tr>
<td>50 kg</td>
<td>25</td>
<td>75</td>
<td>250</td>
<td>750</td>
<td>63</td>
</tr>
</tbody>
</table>

1 Organisation Internationale de Métrologie Légale
2 American Society for Testing and Materials
To realize the mass scale for multiples and submultiples of a kilogram, all members of a weight set must be compared. The sequence of comparative weighings, also called a dissemination or weighing design, serves as link between the mass standards. With the aid of weighing designs, standards of lower and higher nominal mass are derived from the starting point, the 1 kg standard. The masses of the unknown weights can be calculated from the results of these comparative weighings and the known mass of the reference standard.

For example, to calibrate a set of weights consisting of a 10 kg (U10), two 20 kg (U20 & U'20) and a 50 kg (U50) weight from a 10 kg reference standard (R10), a weighing design according to equation (1) can be used. This is a minimal and efficient design, because it requires only as many comparisons as there are unknown weights, namely four. Aside from the number of comparisons and the resolution needed of the comparator, the maximum loading level defined by the weighing design is crucial. In the example given, a comparator with a weighing capacity of at least 50 kg must be available.

<table>
<thead>
<tr>
<th>-1</th>
<th>1</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>-1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>-1</td>
<td>0</td>
<td>-1</td>
<td>1</td>
</tr>
</tbody>
</table>

Clearly, other designs exist to achieve the same purpose. For example, the following design allows the calibration of the same set of four weights with a different weighing procedure.

<table>
<thead>
<tr>
<th>-1</th>
<th>1</th>
<th>1</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>-1</td>
<td>1</td>
</tr>
<tr>
<td>-1</td>
<td>0</td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>-1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Apart from an additional 10 kg weight (C10), this design requires a comparator with an increased weighing capacity of 60 kg, and it involves the standards more frequently in comparisons. The design also requires twice as many comparisons, decreasing its efficiency. However, these measures increase the accuracy of the dissemination. The additional weight can either serve as a check standard to qualify the comparison process, or it can be used as a second reference standard to reduce the mass reference uncertainty. The redundant comparisons increase the degree of freedom of the equation system, which in turn reduces the determination uncertainty.

Common to both designs are the multiple comparative weighings to be carried out with various members of the set of weights. For each individual comparison, two weight sets must be loaded, compared and unloaded. To reduce the standard deviation of the measured mass difference, it is common to repeat individual comparisons several times. While the loading of weights on the platform of a comparator is a demanding operation, it becomes even more of a burden to the operator as the weights get heavier. Mechanical handlers to move the weights are thus a great relief, as they place the weights more precisely, thereby augmenting both productivity and accuracy of the comparative weighings. Many commercially available comparators are therefore equipped with weight movers, usually two-place exchangers. In short, carrying out a dissemination with heavy weights is a lengthy, tedious and error prone process, threatened by the con founding of weights and comparison results, especially if the dissemination is carried out manually.

A New High-Capacity, High-Resolution Mass Comparator

Recently, an automatic mass comparator dedicated to high-accuracy calibration of heavy weights has become available (figure 1). It features a weighing capacity of 64 kg and a readability of 0.1 mg. Except for initially setting the weights onto its four-place turntable, the comparator automatically performs all remaining operations required for calibrations of weights and weight sets.

![Figure 1: The AX64004, a 64 kg weighing capacity automatic mass comparator. The comparator with its four-place turntable is shown in the foreground. The electronic equipment, the comparator's display unit and a laptop PC to control the comparator is visible on the rack in the background.](image)

This rule is based on the allocation of 1/3 of the maximum permissible error (mpe) to calibration uncertainty, with a coverage factor of 2 (confidence level 95%). The standard uncertainty equals 1/6 of mpe. Assuming here that the comparison extends over three links between four standards, each of the standard uncertainties of the comparisons between standards must be reduced by a factor of the square root of 3. Thus, the allowable standard uncertainty of a comparison between two standards should, under these assumptions, meet about 1/10 of mpe.

An buoyancy correction might need to be applied to the comparison results depending on the accuracy attained and on the density of the weights.

A weighing design consists of the comparison matrix, the weights vector and the difference vector. The comparison matrix defines the comparative weighings that need to be performed on the comparator. A positive sign signifies the corresponding weight is a "B" weighing, whose value enters the difference equation as a positive value; a negative sign signifies an "A" weighing, entering the equation as a negative value, and a zero means that the corresponding weight is not involved in this comparison. The weights vector contains the reference standard(s) and all unknown weights, and the difference vector contains all weighing differences.

---

1. This rule is based on the allocation of 1/3 of the maximum permissible error (mpe) to calibration uncertainty, with a coverage factor of 2 (confidence level 95%). The standard uncertainty equals 1/6 of mpe. Assuming here that the comparison extends over three links between four standards, each of the standard uncertainties of the comparisons between standards must be reduced by a factor of the square root of 3. Thus, the allowable standard uncertainty of a comparison between two standards should, under these assumptions, meet about 1/10 of mpe.
2. An buoyancy correction might need to be applied to the comparison results depending on the accuracy attained and on the density of the weights.
3. A weighing design consists of the comparison matrix, the weights vector and the difference vector. The comparison matrix defines the comparative weighings that need to be performed on the comparator. A positive sign signifies the corresponding weight is a "B" weighing, whose value enters the difference equation as a positive value; a negative sign signifies an "A" weighing, entering the equation as a negative value, and a zero means that the corresponding weight is not involved in this comparison. The weights vector contains the reference standard(s) and all unknown weights, and the difference vector contains all weighing differences.
4. [6], p. 40: Design C10: "S.2,2,1,11"
The equipment consists of a weighing platform, a four-place turntable and a set of sub-satiation weights. The heart of the comparator is a weighing cell with a carrying capacity of 64 kg with an electrical weighing range of 260 g and a measurement resolution of 0.1 mg. Substitution weights can be appended in increments of 250 g as the payload on the weighing platform is decreased, thereby providing a continuous comparison weighing range from 0 to 64 kg (Figure 2). The comparator’s sensitivity can be adjusted with a calibrated mass standard of 250 g, which is located in the same holder as the substitution weights.

To weigh a set of weights, the turntable moves and aligns the grid relative to the weighing platform. When the turntable lowers, fins from the weighing platform penetrate through the grid, get in contact with the weights and eventually carry them (figure 3). The automatic exchange relieves the operator from most of the strenuous work. Because the operator need not be present during the weighing process, there is less interference with the weighings, improving the accuracy.

Table 2: Main specifications of the new four-place, high-capacity mass comparator.

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comparative weighing range (load range)</td>
<td>0.64</td>
<td>kg</td>
</tr>
<tr>
<td>Readability</td>
<td>0.1</td>
<td>mg</td>
</tr>
<tr>
<td>Substitution weights: total / switchable in</td>
<td>64 / 0.25</td>
<td>kg</td>
</tr>
<tr>
<td>increments of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical weighing range</td>
<td>260</td>
<td>g</td>
</tr>
<tr>
<td>Calibration weight</td>
<td>250</td>
<td>g</td>
</tr>
<tr>
<td>Repeatability (standard deviation)</td>
<td>0.4 (0.2)</td>
<td>mg</td>
</tr>
<tr>
<td>Measuring time</td>
<td>1</td>
<td>h</td>
</tr>
<tr>
<td>Weight dimensions with cover O’H max</td>
<td>34 x 35</td>
<td>cm</td>
</tr>
<tr>
<td>with cover removed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>virtually unlimited</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Models with 32 kg and 16 kg weighing range currently in preparation.
2 The load must extend at least 2 cm to span two fins of the weighing platform (see figure 3).
3 Determined as standard deviation of 10 one-versus-one, ABA comparative weighings, after drift elimination; stabilization time set to 25 s.
4 The load’s center of gravity must lie below 46 cm above the turntable, or instability may occur.

Table 2 lists the main specifications of the new high-capacity mass comparator. Except for the maximum capacity, the repeatability of the comparator is the primary parameter. For a series of ten comparisons, repeatability is specified with 0.4 mg over the entire weighing range. In well-controlled environments, this value decreases to 0.2 mg (typical) or lower. Figure 5 shows a record of mass difference and repeatability obtained from fifty series of ten measurements; table 3 lists the individual readings of one series of ten measurements.

Figure 4: Various combinations of OIML weights on the platforms. Left: 2’ (10 kg + 20 kg), middle: 10 kg + 50 kg, right: 1 kg + 2’2 kg + 3 kg + 50 kg.

Figure 5: Measurement record obtained from 50 series of 10 comparisons between two 50 kg mass standards (measured by METAS). Depicted is the mean (conventional) mass deviation between the two standards, calculated from groups of 10 ABA comparisons (dots), and the corresponding group standard deviation (error bars). Effects of air buoyancy were not corrected for; however, both standards were of the same nominal density.
Except for a transient at the beginning of the measurement, probably caused by acclimatization, the mean mass difference (including uncertainty) remains within a band smaller than 0.4 mg for the remaining measurements. The group repeatability of 0.1 ± 0.2 mg stays well below the specified value of 0.4 mg.

Two influences tend to degrade the repeatability of a comparator. First, a weight, or a set of weights, which is not exactly centered about the weighing cell, may introduce a measure-ment error, known as eccentric load error. Special care has been given to suppress this type of error. If the center of gravity of the weights does not exactly coincide relative to the center of the weighing cell, the self-centering weighing platform moves to align the weights. This situation is prevailing after the initial loading of the weights.

Table 3: Individual measurement results of one series of 10 ABBA comparative weighings between two 20 kg mass standards.

<table>
<thead>
<tr>
<th>No. of measurement</th>
<th>ABBA mass difference Δm [mg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>39.60</td>
</tr>
<tr>
<td>2</td>
<td>39.60</td>
</tr>
<tr>
<td>3</td>
<td>39.40</td>
</tr>
<tr>
<td>4</td>
<td>39.45</td>
</tr>
<tr>
<td>5</td>
<td>39.50</td>
</tr>
<tr>
<td>6</td>
<td>39.45</td>
</tr>
<tr>
<td>7</td>
<td>39.40</td>
</tr>
<tr>
<td>8</td>
<td>39.35</td>
</tr>
<tr>
<td>9</td>
<td>39.40</td>
</tr>
<tr>
<td>10</td>
<td>39.30</td>
</tr>
</tbody>
</table>

Mean of differences Δm: 39.445
Std.-dev. of differences Δm: 0.098

Second, as the comparator is capable of resolving load differences as small as 0.1 mg with direct readings (and even smaller ones, when readings are averaged), disturbing air drafts must be kept from the load. This is achieved with four individual glass covers (figure 6). If required, temperature sensors can be positioned inside these draft shields to monitor the actual temperature during the comparison (figure 7). This information is useful for air buoyancy correction.

Figure 6: Individual glass covers protect the loads from air drafts.

The size of weighing objects is limited only by the diameter and height of the glass cover. If the requirements on repeatability can be somewhat lowered, or the ambient air is quiet enough, the glass covers may be removed, allowing the user to place even taller objects. Similarly, if a spacer is put under the load, the comparator accommodates objects with larger diameters.

When comparing weights with high resolution, as is the case with the new high-capacity mass comparator, proper acclimatization time must be observed to allow for compact weighing objects to attain the temperature of the ambient air. According to a study of Glaser [7], a 50 kg mass standard with a temperature difference of 0.1 K above ambient appears about 1 mg too light, and it takes as long as 3 days for this temperature difference to reduce to 0.01 K, where the apparent mass offset would diminish to a value around 0.1 mg.

Applications

Due to its features, namely high-capacity, high-accuracy and automatic operation, this comparator is well suited for a variety of traditional as well as new applications. This will be illustrated here with a few examples.

The new mass comparator is the instrument of choice for the calibration and dissemination of high and highest accuracy mass standards. Because of the comparator's excellent repeatability, OIML class E1 (ASTM class 0) weights can be calibrated in the range from 5 kg to 50 kg, class E2 (class 1) from 2 kg and class F1 (class 2) from 500 g. Between 10 kg and 50 kg, weights of even higher accuracy than E1, "class E0" [7], can be calibrated. A 10 kg "E0" standard would allow 1.5 mg of maximum permissible error. An uncertainty of 0.2 mg or better may be reached with several repeated comparison series. Obviously, this mass comparator is the preferred instrument for national metrology institutes, weights and measures verification offices, weight manufacturers and calibration laboratories.

As the comparator's weighing platform accommodates weights arranged adjacent to, and stacked on, each other, many weighing designs that are impossible to be performed on other comparators (or only with the help of auxiliary standards) can now be implemented on this comparator. The second weighing design (eq. 2) is an illustrative example. Also, there are weights, whose shape does not allow them to be stacked. Nevertheless, these can be calibrated.

---

1 Though not defined by OIML, weights of class "E0" could be understood to comprise weights with a relative maximum permissible error (RMP) of about 1/3 of those of class E1, i.e. 0.15 ppm [3].
on this comparator, because they can be arranged adjacent to each other.

A method to obtain a heavy mass standard is to combine many calibrated medium-size weights and to assemble them on a weight tray. For example, to produce a 500 kg weight, 24 calibrated 20 kg weights (i.e., 480 kg total) can be stacked on a tray with a nominal mass of 20 kg. Clearly, the mass of the empty tray must be calibrated with the same accuracy as the mass of the other weights, or the accuracy of the assembly of weights is reduced to the lowest accuracy contributor. While the calibration of the 20 kg weights is state-of-the-art, the calibration of the weight tray is more difficult as a result of its large dimensions. Because of the obstacle-free space above the turntable when the cover is removed, the new mass comparator is capable to calibrate this tray with high accuracy, despite its rather extended dimensions (figure 8). Due to this high-quality calibration of the tray, the 500 kg collection constitutes an OIML class E1 weight.

Other applications comprise the determination of loss or gain of small amounts of mass in conjunction with a large dead mass or structures with large extensions, to an unprecedented level of accuracy. Such examples are the measurement of the amount of gas in heavy contain-ers, or the abrasion of material on gears or turbine blades, among others.

Forces standard machines and primary pressure balances use stacks of disc-shaped weights. To keep the stacks low, the individual discs are designed to have a small height, which results in rather large disc diameters. While these discs often do not fit on conventional comparators, they can be calibrated directly on the 64 kg mass comparator. Should their diameter exceed the already large diameter of the platform, a spacer may be placed under the discs to raise them and allow for even larger diameters (figure 8).

The highly accurate determination of the volume of fluids or gases using the gravimetric method can also be envisaged directly on this high-capacity mass comparator. For a fluid of well-known density, the mass difference between the empty and full container provides a very accurate measurement of the volume of the fluid, or of the volume of the container holding it.

Conclusion

The calibration of heavy mass standards is a difficult, demanding, and lengthy process. The loading and unloading of heavy mass standards is strenuous work if done manually. The accurate placing of the weights in the center of the platform is difficult. Often, weighing designs require multiple standards to be weighed in groups. These designs cannot be considered with many comparators, because they do not provide enough loading space or weighing capacity. Typically, state-of-the-art comparators feature loadings of 0.5 mg at 20 kg or 5 mg at 50 kg. Such resolutions are a handicap for dissemination at the highest accuracy level.

A new automatic comparator with a weighing capacity of 64 kg and a readability of 0.1 mg has become available. Its four-place turntable provides automatic exchange of the weights. The weighing platforms, equipped with individual draft covers, offer enough space to accommodate weighing combinations prescribed by virtually any weighing design. There is no need for auxiliary weights. The weights self-center on the weighing platform to suppress eccentric load errors.

With its excellent comparison uncertainty, this comparator is particularly well suited for the calibration of weight classes such as OIML E1, E2 and F1, or ASTM 0, 1 and 2. Its repeatability of 0.2 mg typical (0.4 mg max) also makes it the choice for mass standard laboratories with ultimate requirements for comparison accuracy, such as national mass laboratories, weights and measures offices, weight manufacturers, or any institution with high-accuracy calibration requirements.

Weights in pounds or multiples thereof, or dead weights adjusted to produce forces in Newton, constitute non-metric weights. These or any other, in terms of metric units, "non-nominal" mass pieces or objects can be calibrated on this comparator with a small number of mass standards, because the comparator’s weighing range continuously covers 0 to 64 kg.

Other applications include the determination of mass of heavy or large structures, such as weight trays, gas containers, and the gravimetric determination of volumes.

References

3. Weights of classes E1, E2, F1, F2, M1, M2, M3. OIML R 111, Edition 1994
4. Weights of classes E1, E2, F1, F2, M1, M2, M3. OIML 2nd Committee draft R 111, Feb. 1, 2000
METROLOGY CALENDAR

NCSLI MEETINGS
August 17-21, 2003
NCSL Workshop & Symposium
Tampa Convention Center, Tampa, FL
CONTACT: NCSL Business Office, (303) 440-3339
FAX: (303) 440-3384
e-mail: <info@ncsliinternational.org>
website: <ncsli.org/conference>

INDUSTRY/GOVERNMENT MEETINGS
Measurement Science Conference
January 16-17, 2003
Tutorial Workshops, January 15
NIST Seminars, January 13-14
Disneyland Hotel, Anaheim, CA
CONTACT: John Bowman, (909) 648-2775
Fax: (909) 273-5500
e-mail: <john.bowman@fluke.com>

Metrology/Quality Systems Symposium
January 14-16, 2003
Antigua & Barbuda Bureau of Standards, St. John’s, Antigua
CONTACT: Dianne Lalla-Rodrigues, 1-268-562-4011
Fax: 1-268-462-1625
e-mail: <abbs@candw.ag>

NACLA 2nd Annual Forum on Laboratory Accreditation
March 17-18, 2003
Sheraton Columbia Hotel, Columbia, MD
CONTACT: NACLA Secretariat
Fax: (301) 963-2871

International Dimensional Workshop 2003
Nashville Marriott, Tennessee, U.S.A.
May 12 - 16, 2003
"Dimensional Metrology - The Uncertainty of Measurement Uncertainty."

• 16 Speakers
• 50 Exhibitors
• National Requirements Day for Dimensional Metrology
• Training Sessions on Monday, Thursday and Friday

Mark your calendars and make plans to attend our fifth annual workshop sponsored by the Oak Ridge Metrology Center, the Oak Ridge Centers for Manufacturing and Material Sciences, the Society of Manufacturing Engineers, Quality Magazine, NCSL International and the Metrology Automation Association.

The IDW will kick off on Monday with training sessions and we will also be hosting a National Requirements Day for Dimensional Metrology in conjunction with the NSWC Corona Measurement Science and Technology Laboratory, and the NCSL International. In addition to the training and the workshop itself, exhibitors will display the latest technology, software and services available to the Dimensional Metrology world.

For all questions and comments, contact:
Ed Pritchard, Workshop Director
<pritchard@y12.doe.gov>
phone 865/574-4261
fax 865/574-2802

CHECK WEBSITE FOR UPDATES
<www.ncsli.org/events/>

Please send Metrology Calendar additions and corrections to the NCSL International Business Office, (303) 440-3339 FAX:(303) 440-3384, or E-mail to <info@ncsli.org>
Now, what if you are an international organization that services the metrology industry? Who are your customers? During this last year, this was an important question for me and the NCSLI Board of Directors as we developed the 2003-2007 Long Range Plan. The purpose of the Long Range Plan (LRP) is to establish a road map for our organization for the next 5 years. While this LRP may change slightly with changes in leadership and membership, the fundamental goals and objectives of the organization remain as the key focus.

As 2002 Executive VP, it was my responsibility to facilitate the development of the 03-07 LRP and to help determine what would be the focus areas of the organization for the coming year. Rest assured, the information that goes into the development of the LRP is not solely the responsibility of the board. Much of the input that goes into the makeup of the final LRP comes from the section and region coordinators and the committee chairs. This information then passes to the respective VPs who work with the Executive VP for final inclusion into the LRP.

The following elements have been identified as ongoing operational objectives for 2003, meant to focus on the operational needs of our organization on a day-by-day basis. In addition to the operational objectives, we have identified "breakthrough" objectives, which are meant to be a focus of the organization for the upcoming year.

Operational Objectives for 2003

Communication:
• Listening and responding to our member companies, member-delegates and the supporting professionals.
• Continue the redesign of the NCSLI website to provide an effective means of communication to the metrology community.
• An evolving and more informative and relevant NCSLI International Newsletter under the able leadership of our editor, John Minck.

Education and Training:
• Work with the academic community to develop new sources of metrology and measurement science training and to sustain these elements in existing programs.
• Continue to develop and strengthen training resources and materials available from NCSLI International.
• Examine and implement additional value-added services requested by our membership for compliance support of national and international standards.

Leadership Succession Planning:
• Continue to develop and identify key personnel for future positions as Committee Chairs, Region and Section Coordinators and for positions on the Board of Directors.

Partnerships:
• Sustain relationships with NMLs world wide to monitor and support their charter in providing basic measurement services and to develop new measurement techniques to support emerging technologies in new economies.
• Actively interface with national and international laboratory accreditation infrastructure through active participation in regional organizations such as NACLA, EA, APLAC and ILAC and through continued relationships with various Accrediting Bodies including NVLAP, A2LA, CLAS and EMA.

Fiscal Management:
• NCSLI International has continued to evolve its fiscal controls, management and budget planning with reporting over the past few years. The organization must continue to be a financially healthy organization by being fiscally responsible and taking appropriate care in managing its resources.

Breakthrough Objectives for 2003:
• Value to the Membership - Some traditional areas of metrology have seen a decline in growth and influence over the past years while some areas have seen an increased emphasis on metrology. The board should look at ways to better understand these evolving markets and how best to support our current and future member companies, member-delegates and supporting professionals in metrology, calibration, testing and the related fields.
• Develop strategic partnerships - There are many academic, government organizations, technical societies, industrial trade associations, and documentary standards development organizations that provide a natural synergy with NCSLI and its member organizations. Establishing strategic relationships with these organizations will only help to strengthen NCSLI's value to the metrology community and its membership. The board should focus on identifying and establishing formal relationships with these organizations.
• Organizational Management - NCSLI International's Annual Workshop & Symposium and international involvement has grown to a point, complexity and cost where traditional volunteer management is being strained. The board should develop a plan to address this issue, through the establishment of a professional position, through expanding the traditional volunteer help, or determining the optimal mix.

With this operational plan in front of us, it is important to continuously measure how NCSLI will meet these objectives. It is equally important to show how the groundwork for meeting these objectives has already started. The following are highlights from recent activities of NCSLI, organized under the 2003 LRP objectives.

Communication: The NCSLI business office continues to improve the NCSLI website as a means of communication. The website currently contains over 50 presentations from the 2002 conference. These provide an excellent opportunity for those who could not attend the conference to see some of the excellent material presented. The website also contains a meeting calendar with meeting dates, times and info for section, regional and committee meetings.

The 2003 Conference in Tampa Bay, Florida, August 17th - 21st, "From State-of-the-Art to the Everyday," is a critical forum for both networking with fellow measurement professionals as well as providing a source of communication and training in the international measurement community.

Education and Training: I am pleased to announce that the NCSLI board has approved a Student Membership, allowing individual students to join the organization. In addition, we have also introduced a
special educational institute membership category. Both of these new memberships are intended to encourage interest from the higher educational sectors of measurement.

More Measurement Uncertainty Workshops are also planned for 2003, two in the winter and two in the spring. Watch the newsletter for further details.

Leadership Succession Plan: There are some new VPs bringing value to the board. Jack Ferris replaces Tony Anderson as Standards Policy VP and Derek Porter will be the new VP of the Western Division. Our thanks to Jack and Derek for accepting these positions and to their organizations, Sleeping Bear Metrology and Boeing, for supporting their involvement.

Partnerships: NCSLI has had liaison relationships with several professional and governmental organizations over the past many years. In addition to these liaison relationships, the NCSLI board is looking at even more strategic relationships with certain trade and professional organizations. More to come on this subject in future newsletters.

The NCSLI Executive Committee met this past fall with management of the NIST and NRC/INMS to further strengthen our relationships with these NMIs and to better understand how we may benefit from this relationship.

NCSLI has made an important step for its member organizations with the appointment of Tony Anderson as the NCSLI Director to ILAC/NACLA. Tony has now officially accepted the role of Chairman of the ILAC Laboratory Committee representing NCSLI interests in this very important laboratory accreditation committee.

I am also pleased to announce that NCSLI now has a formal relationship with EUROMET and Seton Bennett of NPL, United Kingdom, has been appointed as the EUROMET rep to the NCSLI Board. (See Seton’s first report on page 12.)

Fiscal Management: Through the hard work of the Conference Committee and the fiscal responsibility shown throughout the organization, NCSLI will come very close to meeting our projected 2002 budget. In addition to setting the goals and objectives as described earlier through the LRP process, the financial budget for 2003 has been established. This year I am pleased to say NCSLI will be operating on a balanced budget and will not require a dues increase in 2003.

Value to the Membership: NCSLI has established 5 new Interlaboratory Comparison Programs and now will provide the participants with a Certificate of Participation. The board is also trying to understand how NCSLI can best service our membership in the area of Proficiency Testing.

I look forward to an exciting and challenging year, always trying to remember who my customers are, the NCSLI members and measurement community.

Steven Stahley
NCSLI President

Editors Message
(continued from page 2)

Resuming some technical papers

I think most of you are familiar with the decision about 10-15 years ago to stop publishing technical papers in this newsletter. Before that, I regularly reprinted the top papers from the annual conference, since at that time we weren’t organized well enough to manage an event proceedings. One-inch thick conference proceedings are not a trivial accomplishment.

Then came our hard copy proceedings, which seemed to replace a need to publish any of the papers. Later, the CD-ROM technology took over the big printing job of the hard-copy bound editions, saving lots of trees.

But recent Board thinking was to recognize that a large percentage of our member delegates are not, in fact, able to attend the annual meeting. Nor do they purchase the proceedings CD-ROM. Further, our readership includes a large pass-along list of other metrology professionals, who do not attend either.

The result is that in the next few issues, I will publish the top 4 papers from the 2002 conference, beginning with the Allen Astin winning paper by Roehmuth and Richard. Naturally, I will have to shrink down some of the other newsletter material by editing a little harder. Probably you won’t miss it.

A wider range of Member technologies

I sat in on Guy Fleming’s Section 1410 meeting in December. It was interesting to see the increasing attendance of organizations with a pharmaceutical, bio-tech and chemical measurement interest. When one includes companies that make the kinds of instrumentation that supports them, flowmeters and the like, it takes on new meaning.

One new member I talked with was with a company which manufactures the reagents that are used to make drug tests, so the stakes for their product quality are high indeed. Fascinating to an old electronics like me.

That’s all to the good, since the burgeoning bio-tech technology has exciting breakthroughs in its future. It seems to have the kind of excitement that integrated circuits had in the 70s, or software in the 80s. We are fortunate to have these expanding interests by our new members.

John Minek
Editor
REPORT FROM THE EUROPEAN COOPERATION IN METROLOGY (EUROMET)
Seton Bennett

First, some background information about EUROMET, which is a voluntary collaboration between the national metrology institutes (NMIs) in the EU (including the European Commission), EFTA and EU Accession States. The organisation has 25 NMI signatories (representing 79 institutes) as well as 24 corresponding organisations and NMIs, 9 of these being NMIs aiming at full membership.

The Main Committee, which meets annually, is supported by an Executive Committee and a full-time secretariat. The current Chairman, Dr Paul Hetherington, is Director of Ireland's National Metrology Laboratory, and the other members of the Executive are Seton Bennett, Luc Erard, Helge Kildal, Pavel Klenovsky, Arnold Leitner, Attilio Sacconi, and Wolfgang Schwitz.

There are eleven EUROMET Technical Committees:
- TC-AUV Acoustics, Ultrasound and Vibration
- TC-EM Electricity and Magnetism
- TC-F Flow
- TC-IM Interdisciplinary Metrology
- TC-IR Ionising Radiation
- TC-L Length
- TC-M Mass and related Quantities
- TC-MC Metrology in Chemistry
- TC-PR Photometry and Radiometry
- TC-T Thermometry
- TC-TF Time and Frequency

In 2001, there were 207 active technical projects, and on average each NMI is involved in some 60 projects at any one time, the larger NMIs being occupied with up to 160 projects. In particular, the number of intercomparison projects has more than doubled since 1997. This increase is largely due to the many RMO key and supplementary comparisons undertaken in the framework of the CIPM Mutual Recognition Arrangement (MRA). Much of the current activity of the Technical Committees arises from the review and approval of MRA CMCs (Calibration and Measurement Capabilities) submitted by European NMIs and those circulated from other regions.

This is proving a major task, with some 11,685 CMCs having been submitted so far. Of these, 7,985 have been published, 381 are currently under review within EUROMET, while 3,119 are undergoing inter-regional review. These CMCs are supported by a large number of intercomparison projects, with 94 EUROMET comparisons listed on BIPM’s Key Comparisons Database in addition to many hundreds of wider international comparisons.

Meanwhile, EUROMET is reviewing the quality systems of its member NMIs. Quality system presentations have been made by 67 laboratories to QS-Forum, the panel set up for the purpose, of which 31 (46%) claimed to have a fully implemented quality system. It is expected that all the laboratories will have completed implementation of their quality systems by the time the MRA transition period ends in December 2003.

During 2002, two EUROMET guides have been updated as follows:

Guide 3: EUROMET Guidelines on Conducting Comparisons
This updated document replaces the version issued in 2001. It includes the requirement to notify EUROMET comparisons to CCM-Secretaries, as recommended by the JCRE.

Guide 8: Review Criteria and Procedure for EUROMET CMCs
This updated version replaces the version of 2001. It takes into account JCRE adjournments in relation to CMC review criteria, CMC modification and the end of the transition period, defined in the MRA.

These guides are on the website <http://www.euromet.ie/pages/guides/guides.htm>. In 2002, EUROMET adopted a strategy for European metrology, which recognises the increasing demand for metrological requirements in new areas such as life sciences, medicine, chemistry, and food. This comes at a time when many NMIs are increasingly stretched to cope with traditional demands from existing users. The strategy also highlights efforts that need to be made if metrology is not to be seen as a technical barrier to trade.

Against this background, EUROMET Members have agreed to promote the concept of an integrated European Metrology Infrastructure, based on increased collaborative research, better planning and notification of major investments, and a more structured and at times formal approach to the selective provision of services. To investigate further the implications of this strategic approach, and explore the options for realising it, eleven NMIs are participating in a European Commission project called MERA. Further details of this project are also available at <http://www.euromet.ie/pages/projects/proj.htm>. The research and consultation phases of MERA will have been completed by the time of NCSLI 2003, so watch this space.

Ed. Note: Seton mentions that EUROMET recognizes the new link with NCSLI as a "Corresponding Organisation, while NCSLI recognizes them by appointing Bennett to the NCSLI Board."
The main issue in front of the Accreditation Policy Committee (APC) and the ILAC General Assembly as a whole is the requirement for an ILAC Mark. At the Kyoto GA, a year ago, the decision was made to have an ILAC Mark which could be used on calibration certificates and test reports of laboratories whose Accrediting Body (AB) is a signatory to the ILAC Arrangement. The APC was tasked with this work item. Unfortunately the issue has been confused by the continuing discussions about the possible merger of ILAC and the International Accreditation Forum (IAF).

Those in favor of merger want a common Mark for the two organizations. This is vehemently opposed by the LC and has resolved on more than one occasion that it is against a merger and definitely against a common Mark. There is enough confusion in the marketplace between accreditation and certification, a common Mark would only add to that confusion. The whole issue came to a head in the final session of the GA in Berlin and after a passionate debate from both sides of the argument, the ILAC Chair accepted a decision to have a postal vote regarding a single ILAC Mark or a joint ILAC/IAF Mark. This issue will be discussed at the NCSLI Board meeting in Nashville to formulate a formal position from the NCSLI laboratory community.

The LC discussed the issue of NACLA becoming an ILAC regional cooperation and meeting the requirement of having four economies to be a region. The LC is in general support of NACLA’s recognition as a region and questions the rationale of increasing the minimum number of economies for forming a region from 3 to 4.

The new ILAC Articles of Association and Bylaws are ready for ILAC to go forward with incorporation. The incorporation will be in The Netherlands. The General Assembly will review issues related to structure, and participation of stakeholder members, including voting rights, and has assigned the task of review to the Strategic Planning Group as a matter of priority.

National Cooperation for Laboratory Accreditation (NACLA)

I have participated in two NACLA Executive Committee conference calls since the last Board meeting. As a result of the reorganization of the committee structure of NACLA, there is considerable work in progress to revise the QA manual and the related guidelines and operating procedures.

President Roxanne Robinson, of A2LA, represented NACLA at the ILAC Berlin meetings. NACLA was warmly received at the ILAC conference and recognition is growing. NACLA was prominent in Belinda Collins’ presentation to the ILAC membership about US regulatory issues. Dr. Collins is outgoing Past Chair of ILAC. As already stated in the ILAC part of this report, the LC is assertive about NACLA’s right to eventually be recognized as a regional cooperation under the ILAC umbrella. Several EA members support NACLA’s goal.

The next NACLA Board meeting will be in Vancouver, Canada on November 7 through 9, 2002, in conjunction with APLAC 2002. The NACLA Executive Committee will be holding a joint meeting with the APLAC Executive on the evening of November 9th to discuss possible joint cooperation on issues of mutual interest.
Remembering Doug Severance

Frederick Douglas "Doug" Severance
1927 — 2002

Frederick Douglas "Doug" Severance, one of our lifelong NCSLI contributors, died of sudden heart failure on April 15, 2002. The Atlanta Section dedicated their recent spring meeting to Doug, and mourned his passing. Although Doug never served in an official capacity for NCSLI, he was a regular at region and annual meetings. His wife, Daphne, recalled that they had last attended the Toronto conference.

Doug graduated from The Citadel Military College with a BS in Electrical Engineering, in 1950. Before that he had interrupted his schooling at The Citadel to serve his country as a sergeant in the U.S. Airforce from 1945 to 1948. He remained a Captain in the USAF Reserve from 1950 to 1961. He was employed by Western Electric and later with Bivens and Caldwell, an Electronic Sales Representative Company. (Ed. Note: When I first joined Hewlett-Packard in 1958, Bivins and Caldwell represented our sales in the Southeastern section of the U.S. I remember B&C as a classic Southern hospitality organization, and Doug certainly fit that culture.)

Later, he was co-owner of BCS Associates, and associated with the Fluke Corp. then started his own company, DSTechnical Services. He was a member of numerous technical societies, including NCSLI, IEEE, ISA, ASQC, AFSM and SPQG. He will be remembered as a loving husband and father, who enjoyed his work, and whose associates respected him for his professionalism. Fittingly, he died while on a sales call to Georgia Tech. How many of us who love marketing will be able to make that claim? His associates remember him as the ultimate Southern Gentleman.

Survivors include his wife, Daphne, daughters Alisa, Sharon and Susan, and sons, Carl and Craig.
Phil Smith, RDP Corp, suggested a mini road show in late September, 2002, for Pittsburgh, PA, Cleveland, and Heath, OH. As a result of that suggestion the following program was developed.

Southern Ohio/Kentucky Section 1132 completed another successful NCSLI Section meeting, on November 21, 2002. The BioNets Corporation and the Air Force Metrology and Calibration Program Office co-hosted with 52 in attendance. David Baker, Deputy Director of the Air Force Metrology and Calibration Program and Ben Fullen, Program Manager, BioNets Corp, Newark Metrology Operations welcomed the group to the Air Force Primary Standards Laboratory (AFPSL).

Dave Nebel, DEN Technical Services, NCSLI VP, provided board meeting and training program updates. John Wehmeyer, Quality Consultants of Tennessee, then presented his Interactive Measurement Uncertainty Workshop. The attendees supplied many inputs. Lively discussions ensued as John worked through the measurement uncertainty for a caliper.

Walter Firth enlisted Fluke Corporation's Regional Sales Manager Steve Griffin's assistance in providing a presentation on Guardbanding (the best I've ever seen).

Kevin Kaufman, Eastern Regional Sales Manager, TEGAM, briefed the group on the care and feeding of Bolometers.

Paul Hassen, Workshop Training, provided a membership briefing, and Tim Kypta, Borg Warner, got in a plug for his Automotive Metrology Committee.

BioNets provided a very nice spread of refreshments and our restaurant provided their annual Thanksgiving buffet. The meeting wrapped up, with door prizes going to attendees from Battelle, the USAF, BioNets and Boeing.

Tentative plans for the Spring 2003 Section meeting center around a three-hour tour of the AFPSL with the possibility of specialized sessions in several laboratories.

Former NCSLI President Dr. Klaus Jaeger has agreed to provide a presentation during our Spring 2003 meeting. Subject to be announced.

ATTENDIES:

Chad Hilt
Joey Hall
Paul Hassen
Gary Heferling
Jim Herrubron
Joan Hendrick
Jeff Heinrich
Jeff Miskin
Khinda Herger
Kevin Kaufman
Scott Knight
Bob Kulp
Timothy Kypta
Greg Levy
Dwight Lincoln
Dick Maglione
Philip Meyer
Charles Mayo
Gill McCarron
James Meyer
Robert5apor
David Nebel
Charles Metcalfe
Nive Nickerson
Ches Pasyn
Dave Section
Karen Senape
Dale Sheld
David Stearns
Philip Smith
Kevin Smith
Mona Smith
Eric Strider
Darryl Stutchen
John Wehmeyer
Edward Wood

A unavoidably biologically
differentiated and
discriminatory arrangement
of the earth's
atmosphere

Nice job on attendance, Charlie. When I was born in the Northwest part of Ohio, before WWII, no one there had ever heard of metrology, although it was going on at nearby Wright-Patterson AFB.
Our Atlanta late-spring meeting started under a cloud. Doug Severance, part of our local NCSLI section meeting planning committee and a fixture in the Atlanta test equipment market suddenly passed away a few days before the meeting. He was and will be missed. We dedicated the meeting in his honor.

We opened with remarks by Jack Shuler, our region NCSLI representative, and a welcome from our facility host, Dr. Gloria Purell, Director Center for Quality Excellence, Southern Polytechnic University. Then Dean Ansley, Engineering Technology and Management Professor, set the stage with an overview of Australia's tie to the Kyoto accords and building engineering technology.

Our first featured speaker was John Lynch of Law Engineering, notably the most senior A2LA assessor, who addressed the Impacts of Automation on the cal lab.

John was followed by Peter Dack of Fluke Precision Measurement. Peter spoke on Putting Theory to Test with a technical look at lab practices. Doug Lynde of On Time Support spoke on Combining Automated Metrology, introducing the group to the process calibrator, databases and SQL. Stephen Webb of HBM spoke on Global Measurements, rounding out our day with more process calibration issues, including transducer self-identification.

Before he retired from the AT&T/Lucent/OFS Atlanta cable plant facility, Wes Harris managed to master the self timer and put himself into our group picture. The committee offers thanks to our exhibiting vendors who help underwrite the facility and food service charges, and to the attendees for the participation in spite of the challenging times.

The Atlanta Section gathers outside, under a bright blue Georgia sky. But, behind the trees is either the moon at mid-day or a streetlight. Without further explanation, my daughter would hum the ocean-chase theme from "Jaws," doo-doo-doo-doo.

The Fall 2002 NCSLI Kansas City section meeting was held on October 10, 2002 at the Harley-Davidson Motor Company assembly plant in Kansas City, MO. George Young of Harley-Davidson hosted an informative and interesting meeting. Twenty-nine people from eleven different companies were in attendance.

The day started at the Harley-Davidson visitor's center, where several different motorcycles, parts and processes are on display. The Sportster, Dyna Glide, and the new V-Rod motorcycles are all built at this plant.

After welcoming by Roger Burton and George Young, Paul Hanssen of Workplace Training spoke to the group about the benefits of NCSLI membership and encouraged non-members to join. Next, were three technical presentations:

Speaker: Eric Burkhardt, Honeywell FM&T Topic: NVLAP Accredited Laser Wavelength Calibrations

Eric presented an overview of a NVLAP accredited laser wavelength calibration process for HeNe lasers. By inter-comparing a laser with a NIST calibrated laser, the laser wavelength uncertainty can be improved by a factor of about 20. This essentially removes the laser wavelength from most uncertainty budgets for measuring processes that utilize HeNe laser interferometers for high accuracy dimensional measurements.
Speaker: David Lobsinger, Harley-Davidson  
Topic: The Role of Metrology in Continuous Improvement Projects

David presented an excellent example of a continuous improvement project to measure and improve the quality of paint applied to gas tanks. To ensure that stakeholder's needs are met or exceeded, Harley-Davidson uses an approach called Concurrent Product and Process Delivery Methodology (CPPDM). At Honeywell, we would call it a Blackbelt, Greenbelt, or a Design for Six Sigma project.

External customer surveys (Voice of the Customer) drove the need to develop cosmetic standards for painted parts. The project included a gage R&R study (Measurement Systems Evaluation) to evaluate the capability of the paint quality measurement process. Initially, the quality of the paint was determined by visual inspection, with the assignment of a number from 1 to 10, where 1 = low quality and 10 = high quality. As you can imagine, this measurement technique was extremely subjective with a high variability. A smoothness tester was then obtained to measure paint quality. The smoothness tester could be checked against standard paint samples to provide an accurate and repeatable method of measurement.

By using the smoothness tester, the results of the painting process could be measured reliably. Using Design of Experiments, various parameters of the painting process were varied and optimized to produce outstanding paint finishes.

Speaker: Micky Kilpatrick, Agilent Technologies  
Topic: Overview of Digital Communications Systems

Micky presented an overview of various digital communications systems. The basic functions of digital transmitters and receivers were summarized. The presentation also touched on topics including frequency ranges, wavelengths, modulation techniques and their efficiencies, bit rates, symbol rates, and the practical applications of the various systems. This presentation served to bring many of us up-to-date in the field of modulation and digital communications.

Following the technical presentations, a group photo was taken and everybody had lunch in the cafeteria. After lunch, the group toured the Harley-Davidson facility. Of particular interest was the obvious attention of Harley-Davidson associates to quality in design and fabrication. Their manufacturing emphasizes quality and demonstrates high concern for safety and health of associates using excellent ergonomic design in the manufacturing facility.

They exhibit a high concern for human factors in quality manufacture through regular rotation of work assignments and making each task so that it can be performed well by the smallest woman or the largest man. They have a highly developed "work team" environment where the team makes decisions and the team's goals are shared by everyone. The day's activities came to a close with the completion of evaluation forms and drawings for door prizes.

I would like to thank all those who were in attendance, and Eric Burkhardt, David Lobsinger, and Micky Kilpatrick for giving excellent presentations. In addition, I would like to thank Agilent Technologies, Fliske, and Harley-Davidson for providing door prizes for the meeting. Lastly, George Young and Harley-Davidson deserve a special thank you for hosting the meeting and providing refreshments.

Reports From the Regions

November 14th, 2002
Promega Corporation
Madison, WI
Jay Bucher
Madison Section Coordinator

Twelve people were in attendance at the November 14th, 2002, Madison Section meeting held at Promega Corporation in Madison, Wisconsin. Promega furnished excellent facilities and the cost of snacks and lunch were 'pay as you go' for this meeting.

Jay Bucher welcomed everyone, and opened the meeting by having all the attendees give their name, company and what they do. There was a large variety of companies and experience on hand.
Reports From the Regions

Presentation: Meeting cGMP Calibration Requirements in The Pharmaceutical and Biotechnology World
Speaker: Jay Bucher from Promega Corporation

Jay's presentation covered the following topics: review of a quality system, metrology management, accuracy and precision, calibration procedures and records including how Promega's Metrology Department went paperless, requirements for record documentation, scheduling and environmental issues, traceability concerns, and some lessons learned. Many questions were asked, and a lively discussion around 21CFR Part 11 hopefully answered some of the concerns aired by attendees.

Presentation: Why Join NCSLI?
Speaker: Keela Sniadach, Madison Section Membership Chairperson, from Promega Corporation

With many non-members in attendance, Keela gave a very informative presentation on what NCSLI is, who should join, membership benefits, how to apply for membership, and miscellaneous contact information. She also updated the group on volunteering for the steering committee, speakers, and hosting section meetings.

After the group picture was taken, lunch was had at Promega's cafeteria. It should be noted that the large statue in the picture has a unique history. It was hand carved in Africa from a tree that actually grew on the site where Promega's facility now stands. The tree (at least a portion of it) was shipped to Africa, carved, and returned for display. The mother and child now stand in the atrium, where they can greet guests and Promega employees alike.

Presentation/Panel Discussion: The American Society For Quality (ASQ) Certified Calibration Technician (CCT) Program
Speaker: Jay Bucher from Promega Corporation, and David Wirtz from Process Control Solutions

Jay gave a presentation from Chris Grachanen's Power Point presentation on the same subject. Jay updated the group on where ASQ's CCT program is at this time. Then Jay (an SME on both the Job Specification and Item Review Workshops) and Dave (an SME on the Item Writing Workshop) fielded questions on the CCT including: program status, CCT requirements, benefits and applicability of the CCT, and potential training plans. The Body of Knowledge (BOK) was given to all attendees, and possible scenarios were discussed for future training to receive CCT certification.

After door prizes were handed out (even though the attendance was low, the quality of discussion was high, and all participants received a door prize), there was a brief tour given of the Promega Metrology Department. This included how pipettes are calibrated and a look at the Metrology Automated Management System (MAMS) used to support the metrology program.

On behalf of the entire staff of TEAM METROLOGY, I would like to thank all of the attendees for their participation and interest in the topics presented. We had a varied group of people, and it is hoped that future meetings can be attended with the same vigor and enthusiasm. I would also like to thank Keela Sniadach for her informative presentation, and again being our contact point for this section meeting.

For all the hundreds or thousands of captions I may have written in my lifetime, I think Jay has submitted a photo for which I am stumped. Jay suggested, "We may not have a large attendance, but our average height is on the 6-sigma limits." Actually the statue started as a tree on the Promega site, was carved in Africa, and returned for their atrium.

REGION
October 24, 2002
Lockheed Technical Operations
Stennis Space Center, MS
Ken Garcia
Gulf Coast Section Coordinator

The NCSLI Region 6, Gulf Coast Section held its fall meeting on October 24, 2002. The meeting was hosted by Lockheed Martin Technical Operations at their new Integrated Metrology Center (IMC) located at NASA's Stennis Space Center in south Mississippi.

Forty attendees represented a wide variety of government, contractor and commercial entities, with personnel from Alternative Energy Systems, Guideline, Schnumberger, JM Test Systems, Lockheed Martin, the State of Minnesota, Entergy, GB Tech, Fluke, Ruska, Kay Associates and EMA Instruments.

The meeting opened with coffee, pastries and a welcome from Ken Garcia, IMC Metrology Engineering. Next, Jim Marcusen, LMTO Site Manager, gave a presentation on the various activities of the Lockheed Martin Mississippi Space & Technology Center. Mark Hayes, IMC Laboratory Manager, gave an overview of the IMC Metrology services and training facilities.

An informative presentation on "Mass Calibrations" was given by Carol Hockert of the Minnesota Department of Weights and Measures. Carol provided lots of practical information including details of the various specifications and standards dealing with mass. As NCSLI Region 6 VP, Carol was also able to provide news from the latest board meetings and other NCSLI business.
Congratulations to JM Test Systems in Baton Rouge, Louisiana on their recently achieved A2LA accreditation. Jerry Kraus shared lots of pointers and lessons learned during their preparation, audit and post audit experiences.

After a lunch provided by the IMC, attendees were treated to excellent presentations on "Automated O-Shape Calibrations" by Randy Fowler of Fluke, and "Gravity, Its Role in Piston Pressure Gauge Metrology" by Kurt Solis of Ruska.

The meeting adjourned with some discussion of topics for the spring meeting followed by a drawing for door prizes of T-shirts, calculators and mugs provided by Lockheed Martin.

Finally, attendees were provided a tour of the new Integrated Metrology Center laboratories as well as the manufacturing areas of the Lockheed Martin Mississippi Space & Technology Center.

For information about the Gulf Coast Section please contact Ken Garcia at <kenneth.l.garcia@lmco.com> or 228-813-2075. Our Spring meeting will be held in April.

Coordinator Garcia gets an attendee for pulling in this size of crowd to his meeting. Maybe the proximity of The Big Easy (New Orleans) was a draw.

---

Breaktimes are often just as valuable as the formal presentations as the friendly atmosphere of NCSLI meetings allow for personal networking and technical support.
Reports From the Regions

Our presentations were as follows:

Godfrey Kwan  "Vector Network Analyzer Calibrations"
Richard Ferrell  "Liquid Flowrate Calibrations"
Tom Daniel  "Instrument Timebase Calibrations"
Jim Wookey  "Improving Accuracy of Power & Power Quality Measurements"
Roger Stewart and Martin Farah  "HDR's Design for NIST's Advanced Measurement Facility"
Charlie Motzko  "Overview of the Board of Directors meeting"

The papers were all well received. Also at the meeting, Clinton Eldridge discussed the efforts that may lead to NRC qualifying cal labs based on accreditation to ANSI/ISO/IEC 17025.

Many thanks to all those who participated and especially those that gave the presentations.

Attendees:
Charlie Balken  Self
Victor Cleveland  Amax Management Systems
Gary Davidson  Sand, Davidson and Associates
Terrence Dixie  PDL
Braden Downie  RiteTec
Deanna Dubu  PGE
Tim Edye  UAL
Chilton Eldridge  HDR
Richard Ferrell  Proteus Industries
Steven Fink  Proteus Design Lab
Gary Fleming  Lockheed Martin
Leva Fong  Lockheed Martin
Ed Garn  MedImmune Vaccines
Dan Gintner  Pratt & Whitney
Jeremy Graug  RS Calibration Services
Ron Hester  Lockheed Martin
Hans Honig  LSI Logic
Harold Johns  Agilent Technologies
Dana Kamen  LSI Logic
Godfrey Kwan  Agilent Technologies
Tony Lo  Lockheed Martin
Tom Martinson  Lockheed Martin
Richard Medley  Pratt & Whitney
John Minick  Agilent Technologies (Retired)
Charles Motzko  CA, Mesare and Associates
Tom Naylor  SMUD
Carl O’ooke  Semco Electronics
Carl Reddick  Tetraspec
Al Swary  UAL
Roger Swearing  HDR
Arif Subseon  UAL
Christine Sullivan  LSI Logic
Mike Thurs  PDL
Mike Townsend  Lockheed Martin
Rick Wagner  Delco Research Inc
Jim Walter  Fluke
No York  Proteus Industries

Yes, sunny California gets visitations by our Metrology Santa too. If you look closely, you might figure out who this jolly fellow is. I think Fluke helped Santa on the doorprizes.

Actually, in the interest of full disclosure, the picture is a computer composite done by Edward Natoile, a friend of Guy Fleming’s son. I don’t know if he is a friend of Charlie Motzko?

We thank Lockheed Martin for their continued strong support for our local section, in spite of the fact that some of their operations have been transferred to the Stennis Center in Mississippi.

*******

14 Nov. 2002
Southern CA Edison
Westminster CA
Jim Smith
Orange/ LA County Section

The NCSLI Uncertainty Traveling Road Show barnstormed into Southern California, stopping at the SCE/ESI Metrology facility in Westminster, CA. Hosted by Jack Burdick, Jennifer Smith and their team of Quality & Metrology personnel, the workshop was an unequaled success. More than 90 people attended the limited seating show with attendees coming from a wide geographical area from San Diego to Sacramento. Some attendees even flew in from Salt Lake City, UT, for what was the most cost effective UA training on the West Coast. Industries represented were a broad mix of Military, Government, Aerospace, Biomedical, Power Distribution, Instrument OEM suppliers, distributors, rental agencies, internal & commercial calibration suppliers.

The road show additionally allowed NCSLI to develop a broadened service to local meetings where payments can be handled directly at the Boulder, CO business office via credit cards prior to the date. This allowed the 90+ attendees to be registered and seated within 30 minutes of the start of class with no complications. Waiting list
attendees were available to fill spots left open by last-minute cancellations.

The workshop was a catered affair for lunch with a continental breakfast and refreshments provided throughout the day. On the prior evening, SCE hosted a Metrology mixer at a local restaurant/brewery for those local attendees and any who had driven in early. All this and a top shelf assembly of speakers for a $20.00 fee, not bad at all.

Due to a packed agenda, the Coordinator (Jim Smith, Boeing IDS) played ringmaster to ensure the speakers and presenters kept to a fairly aggressive and tight schedule. After welcoming remarks and announcements, Larry Nielsen, of SCE & NCSLI VP, provided the latest NCSLI Board updates in very concise format allowing and setting a quick pace for the rest of the morning's sessions. John Bowman from Fluke Corp., representing the Measurement Science Conference (MSC), provided a brief overview and invitation to the upcoming conference 13-17 January, 2003, at Disneyland Resort.

The initial workshop was provided by Thorn Adams of A2LA, who covered the working application of the GUM. Thorn took the intimidating NIST guide and in a total of 55 slides broke it down into a foundation for Uncertainty discussion that would be built on throughout the day by specific discipline presenters and attendees.

It needs to be mentioned, the majority of presenters had done a Road Show the day before in Dallas, TX, and had hopped planes to attend & present again on Thursday. To all that put themselves through that traveling circus mode, NCSLI and all the attendees are very grateful.

After break, Ron Ainsworth of Hart Scientific discussed the topic of UA as it affects temperature calculations. The major part of discussion concerned PRTs along with effects from both designs that can contribute or must be accounted for. This topic was very applicable to the attendee mix due to the rapid growth in awareness of long term sensor measurements and process applications.

Southern California Edison's Curt Casto & Larry Nielsen were recruited to add an additional presentation to the previous day's agenda. This well-recognized pair covered applications of use with automated Uncertainty Analysis software, which gathers & presents the related subject matter to the specific calibration.

Returning to the physical measurement topics was the last workshop of the morning, which was presented by Kirk Mosher of Ruska.

Kirk detailed in depth the application of calculation relative standard pressure measurement, with special emphasis on pistons & dead weight testers.

A catered buffet lunch of chicken parmagiana, vegetarian lasagna, pasta alfredo primavera and assorted sweets was provided and well enjoyed. We mention this because the sight of seeing so many measurement professionals agreeing on any subject is noteworthy. The group picture followed lunch, which again was entertaining, because the requirement to squeeze together offered plenty of opportunities for comment.

Kicking off the afternoon workshop sessions was a late replacement, OWNI NIST's Val Miller. Val took the opportunity to cover the Balance/Mass Uncertainty and the recently released NIST Guide NISTIR 6919 that he authored. The presentation was laced with humorous applications, which kept the recently-fed attendees interested and involved (and awake).

The final presentation of the day was provided by Fluke's Richard Ruddis. It covered Electrical Uncertainty in a direct example of a 10MHz oscillator using a GPS receiver. Use of this example included an assortment of topics and insights provided throughout the day and reinforced their application by going through a build-up UA budget for a common process.

All presenters were presented with a "genuine" Egyptian cubit artifact (made in China). Questionable research indicated that this object was actually used historically as a Government guide, ancient bath stirrer, calculator, granite piston, mass substitution standard and the first known GPS. Unfortunately all the support data was destroyed during the meeting clean up and will have to again be researched by the Boulder business office. Again, our thanks go to Doris, Joan, Craig, all the brainstorming presenters, SCE's staff of volunteers and most importantly all of the attendees who made the workshop a great success.

The meeting summary and survey showed that all expectations were met and the only noted area of improvement would be screen based. Volunteers for a following UA show, covering a number of other disciplines, were recruited. Presently we have seven interested workshop volunteers to participate. Consensus was that attendance should be opened to larger groups. Tours & Software demonstrations were provided following the meeting.

**Attendees:**
- Mike Dannehower
- Thomas Moore
- Alan Driscoll
- Robert Schenkner
- Larry House-Garrity
- Art Willett
- George Phillips
- Don Folk
- William Firestone
- Tom Morgan
- Gary Glenn
- Bob Plonkanski
- George Wheeler
- Jim Clark
- Dennis Gooden
- Jim Smith
- Stephanie Abner
- Art Packard
- Steve Metz
- Robert Sell
- Doug Tognazza
- Steve Now
- Ann Gallagher
- Steve Blakesley
- Chuck Goerner
- Harshad Shah
- John Newcomer
- Ben Forte
- Robert Webber
- Joseph Moonsen
- Robert Swircha
- Pat LeBlanc
- Harry Wherley
- Bruce Campbell
- Al Miller
- Roy Miller
- Joe Jaworski
- Art Martinez
- Greg Balasone
- Curtis Winer
- Rick Cleek
- Dini Hansen
- Donald Hoke
- Daniel Chang
- Bernece Maklew
- Guy Mathews
- Jan Richters
- Paul Nelson
- Tony Forslund
- Steve Lessard
- Glen Servo
- Curt Cato

**Attendees:**
- Beta Telecommunications
- Alpha Telecommunications
- Agilent Technologies
- Agilent Technologies
- Alcatel Lucent
- Alcatel Lucent
- Boeing
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Quarters were tight but turning down the AC kept everyone awake.

Three sub-regions furnished people for this excellent turnout of 90 students of the Uncertainty Road Show. Kudos to the organizers and attendees, one from as far away as Utah.

**********

**SPOTLIGHT REGIONAL MEETING**

**REGION 1430**

**November 15, 2002**

BC Research
Vancouver, British Columbia
Keith Cable, Region 1430
Coordinator
Dr. Malcolm Smith, Region 1750
Coordinator

NCSLI Northwestern USA & Western Canada Fall Region Meeting

Ed. Note: I believe that this meeting is a first. The first time two international sections cooperated for a combined meeting. From the looks of the picture, it was a great success.

Dr. Malcolm Smith of Wescan Calibration Services, our host, welcomed us to our fall meeting. Vancouver provided an attractive venue for the Northwest region and allowed an opportunity for a meeting of the Western Canada region.

NCSLI President Charlie Motzko presented the Board of Directors' meeting highlights from Nashville. We were also honored to have future presidents Steve Stahley and Dave Agy at the meeting.

Jesse Morse, of Fluke Corp., reviewed the activity of the 2540 committee and detailed the nature of its work.

QLT's James MacNamee discussed the impact of regulations on a biopharmaceutical company.

Tony Reed, of Boeing Puget Sound Metrology, presented mass calibration and reviewed his work to improve customer support.

Lee Bravnen, NQA-USA, presented coming changes to AS9000 and their effects on aerospace industries.

Gary Hysert, NRC, crossed the continent to explain Canada's Laboratory Accreditation System.

Regina Robertson, National Association of Testing Authorities (NATA, Australia's accrediting body) presented a non-North
American view of laboratory accreditation. NATA is the grandfather of the third party accreditation system in use around the world today.

After an excellent meeting we were offered a tour of BC Research. The tour gave insight into the privatization of research. Attendees were shown labs supporting biology and chemistry and were also given tour of the wave tank facility.

Thanks to both coordinators for this innovative meeting. The combined region meeting plans have been put forward again with a scheduled meeting at Fluke at Everett, WA, on May 9.

Presentations

Opening Remarks & Presentation - Dany Duchesne, Director, Laboratories - IREQ (Mr. Duchesne’s presentation is reproduced at the end of this report.)

NCSLI Board of Directors - Oct. 2002 Meeting Highlights & Updates - Charlie Moteko & Steve Stahley - NCSLI Executives

Uncertainties With Air Resistors - Nick Allen, Guideline Instruments

All You Ever Wanted To Know About Accreditation MRAs - Gary Hyser, NRC

Improvements In The Determination Of Effective Area Through A Piston-Cylinder Pressure Calibration Chain - Michael Bair, DH Instruments

Sources of Metrology Education & Training Available to Canadians - Graham Camerou, SCC

Precision Multimeter Measurement - Putting Theory To Test - Peter Dack, Fluke

Measurement Uncertainty For Dummies - Mike Ouellette, NRC

Traceability to National Standards With NRC Travelling Std. Program - Rejean Arsenault, NRC

Updates to the Directory of CLAS Labs - Jean Lafontaine, NRC

Canadian Laboratories Participation & Performance in International Interlaboratory Comparisons - (Frank Doucet, NRC) Presentation by Mike Ouellette, NRC

NCSLI Business

Certificates of Appreciation were given to all speakers and also to the following people who made a significant contribution to the successful operation of our conference.

Suzanne Gendron - IREQ
Suzanne Racine - IREQ
Elizabeth Lambe - NRC
Reports From the Regions

Special Thanks:

NCSLI Canadian Region would like to thank Sylvain Morin and Robert Armand from IREQ for stepping in at the last minute to fill in for a speaker cancellation. Their presentation on the IREQ quality system and procedures was very interesting.

Special thanks also go to Carlo Rea of Techniel Engineering for once again organizing the exhibitors. It is people like Carlo who make our meetings and conferences successful.

We were also pleased that NCSLI President Charles Motzko and Exec. VP Steve Stahley were able to attend our meeting to better understand the operations "North of the Border."

Thanks to all speakers and exhibitors and the great contribution from NRC.

Tour of IREQ

Many of us visited the impressive calibration and testing laboratories at IREQ. The accredited scopes for all four laboratories can be viewed at <http://www.scc.ca/certiflc/labs.html> Laboratories #157, 241, 242 and 343.

2002 NCSLI EXHIBITORS

The following companies exhibited at our conference.

Julio De Pastena
Richard Dubanel
Steve Johnson
Yves Levesque
Bill Ormerod
Xiangqiao Qiu
Ken Roberts
Joe Santo
Kevin Saunders
Pat Stuart
Anthony Ulrich
Claude Boudraut
Imran Dimitry
Connie Ramier

Future Canadian NCSLI Meeting and Conference locations:
Spring of 2003 TBA (in the Toronto Area)
Fall of 2003 NRC, Ottawa, ON.

A good-sized turnout poses for the requisite audience shot at the annual gathering of the Canadian Metrology Intelligentia.

Keynote

 Allocutia de M. Dany Duchesne

Directeur, Laboratoires
Institut de recherche
Hydro-Québec

NCSLI - National Conference of Standards Laboratories
International, Section Canadienne

Le Jeudi 24 Octobre 2002, Varennes, Québec
I am very pleased to be able to welcome you today to this autumn symposium of the National Conference of Standards Laboratories, Canadian region. As Director of the Laboratories Department, a department which includes the Calibration and Repair Laboratory, I can assure you that you will be in good hands during this symposium. I am particularly proud of the staff of our Calibration and Repair Laboratory. This group is made up of dynamic, responsible and enterprising individuals who have earned my respect and admiration.

I consider metrology to be essential for success in research and development. In today's world, I am unable to conceive of a testing laboratory that does not make use of adequately-calibrated equipment while carrying out its mission of validating a scientific discovery or of certifying conformity to a test standard.

I would like to stress that our Laboratories Department now includes five divisions that have obtained their accreditation according to ISO 17025. Calibration of equipment truly is a daily fact of life for us.

This is the second occasion on which the Research Institute has had the pleasure of hosting the fall meeting of the NSC LI, the first symposium having been held on October 19 and 20, 1994, eight years ago almost to the day. Hydro-Québec is proud to be a member of this international organization, which now includes 1500 members and whose mission is to advance technological and managerial excellence in the field of metrology, measurement standards and instrument calibration. At the time of the last symposium, the Calibration and Repair Laboratory found itself in the final phase of accreditation in accordance with ISO Guide 25, an accreditation which was granted in two stages in 1995 and 1996. This accreditation was then followed by that for ISO 17025.

There is one aspect of our work which I would like to underline. Since obtaining its ISO accreditation, the Calibration and Repair Laboratory has undergone a period of continuous expansion. For example, between 1993 and 2002, the number of calibrations carried out annually has increased from 1200 to 2300, an increase of almost 90%. The average annual number of calibrations carried out per person has increased from 240 to 350, corresponding to a productivity increase of 45%.

Similar figures apply also to our Equipment Repair department.

In 2001, the Calibration and Repair Laboratory provided services valued at 2 million dollars.

I can assure you that ISO 17025 and the pursuit of excellence in no way constitute a hindrance to growth, quite the contrary. I believe that accreditation constitutes a guarantee of confidence and credibility, a guarantee which our clients desire and respect.
The old and the new—with apologies to Mike Suraci (l), arguably our longest-time contributor, with exemplary service back almost to the beginning, and NCSSL President in 1976. Steve Stahley is the entering President for 2003.

Craig Gulka (l), Dave Nebel (c) may be giving some organizational advice to our new incoming Executive VP. Dave Agy. Dave moves up from secretary, so he is not a naive newcomer.

Dr. Belinda Collins (l) and Georgia Harris, both of NIST discuss Dr. Collins’ presentation to the Board.

Since the Board meeting was in Nashville, TN. Gary Shuler (r) and his wife came by to renew some old friendships with Tony Anderson.

Larry Nielsen (l) and Derek Porter get ready for a sumptuous dinner, one of the few “perks” of this demanding industrial volunteer activity.

"Old Past Presidents Never Die," they just come back to serve. Dave Abell (l) will take up duties as Secretary. John Ragsdale gets to take off a year to decide what to do with his NCSSL life.
STANDARDS POLICY
Jack Ferris, VP

U.S. MEASUREMENTS REQUIREMENTS
Jeff Walden

The committee met during the NCSLI Annual Conference in San Diego. That meeting report was given by Chet Franklin at the Board Meeting. The committee is proceeding with their plans for a web-based USMRC system. A meeting is planned in conjunction with the Measurement Science Conference.

CANADIAN MEASUREMENT REQUIREMENTS
Les Peer
Lorraine Williams

The committee is undecided on the next steps that they should take. They will be meeting in conjunction with the Canadian Section meeting, October 24th and 25th in Montreal.

GLOSSARY
Bob Hardy

Bob attempted to hold a committee meeting in San Diego with disappointing results. He feels there is no interest in the Glossary, and would like to step down from the chair.

MEASUREMENT SCIENCE AND TECHNOLOGY
Richard Pettit, VP

Activities:
- Initiated work on the Technical Program for the 2003 NCSLI Conference in Tampa, FL.
- Sent email to all speakers requesting they post their vugraphs on the NCSLI web page (currently have over 50 presentations) and to be listed in the NCSLI potential speaker directory.
- Assisted in the development of a "Certificate of Participation" for companies that are a part of NCSLI-sponsored interlaboratory comparisons (ILCs).

Committees:

AUTOMATIC TEST & CALIBRATION SYSTEMS
Scott Sowerby

Committee met at NCSLI in August 2002. Primary topics for discussion include the following:
- Standard model for validation and verification of software
- Standardized data results from automated calibration systems (open data specification)
- Traceability and uncertainty in automated calibration systems
- Integration and use of today's software tools to impact automation efficiency
- Electronic records and signatures

MEASUREMENT COMPARISON PROGRAMS
Jim Wheeler
Al Teruel

NCSLI needs Interlaboratory Comparison (ILC) coordinators to step up to the plate to lead ILCs in measurement areas to help labs gain accreditation. The committee would like to organize a working group of 3 or 4 past NCSLI MCP coordinators to help develop criteria to evaluate information and data for Dr. Bob Watters' (NIST) new US National Intercomparison Internet database. Please e-mail us if you are interested. Such linkages in this database involve measurements, calibrations, measurement comparisons, and proficiency tests that involve a hierarchy of standards and standards laboratories, ultimately linked with those used in international comparisons.

Report:

The "Guide for Interlaboratory Comparisons", RP-15, is being updated and will include information on the new ILC certificate, National ILC database, SRM topics, data from ILAC 13 and ISO Guide 43, information on the NIST DataPlot program and an updated Bibliography. The RP will also be called a "Recommended Practice for Interlaboratory Comparisons" instead of a "Guide for Interlaboratory Comparisons."

We hope to have most of the material included in the RP re-write by our meeting time at Measurement Science Conference (MSC).
Material for the update was provided by Georgia Harris, Larry Tarr, Tom Osimet, Clark Hamilton, Jeff Gust and Dick Pettit.

The NCSLI MCP Committee Meeting at MSC is on Wednesday, Jan 15 from 2 to 4 PM in the Board Room, Bonita Tower.

The first ILC Completion Certificates were issued for labs participating in the Josephson Junction ILC.

Jason Tang, Boeing, reports that there we have 19 active participants in the 10-Mohm ILC. The ILC round robin is about 55% completed. Due to the delay of this ILC program, its estimated completion date will be in September of 2003.
### MCP Activities Table

<table>
<thead>
<tr>
<th>Measurement Discipline</th>
<th>Range</th>
<th>Point of Contact</th>
<th>Phone No.</th>
<th>E-mail Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass</td>
<td>1 Kg</td>
<td>Jim Ross (Quality Control Services)</td>
<td>(503) 236-2712</td>
<td><a href="mailto:Lab@qc-services.com">Lab@qc-services.com</a></td>
</tr>
<tr>
<td>Dimensional (Steel and Chromium Carbide)</td>
<td>0.25, 0.5, 0.75, 1.0, 2.0 and 4.0 inches</td>
<td>Brian Foltz (Rockford Calibration Service)</td>
<td>(815) 877-0880</td>
<td><a href="mailto:Brian@thecalibrationsolution.com">Brian@thecalibrationsolution.com</a></td>
</tr>
<tr>
<td>Helium Leak</td>
<td></td>
<td>Pat Abbott (NIST)</td>
<td>(301) 975-4838</td>
<td><a href="mailto:patrick.abott@nist.gov">patrick.abott@nist.gov</a></td>
</tr>
<tr>
<td>Vector Automatic Network Analyzers (VANA)</td>
<td>Supports 2.4 mm, 2.52 mm, 3.5 mm, GPC-7, 7-16, Type N Connector Types</td>
<td>John Cable - Coordinator (Honeywell FM&amp;T)</td>
<td>(816) 997-4361</td>
<td><a href="mailto:jtcable@kcp.com">jtcable@kcp.com</a></td>
</tr>
<tr>
<td>NIST National Internet ILC Database</td>
<td>Various</td>
<td>Bob Walters (NIST)</td>
<td>(301) 975-4122</td>
<td><a href="mailto:robert.walters@nist.gov">robert.walters@nist.gov</a></td>
</tr>
<tr>
<td>(Josephson Junction) DC Voltage (Started in 2002)</td>
<td>10 VDC</td>
<td>Dave Deaver (Fluke)</td>
<td>(425) 356-5094</td>
<td><a href="mailto:deaver@liu.f1uke.com">deaver@liu.f1uke.com</a></td>
</tr>
<tr>
<td>Resistance</td>
<td>POC 1 ohm ILC Coordinator</td>
<td>Jeff Gust (Verizon)</td>
<td>(219) 428-6504</td>
<td><a href="mailto:jeff.gust@supply.gte.com">jeff.gust@supply.gte.com</a></td>
</tr>
<tr>
<td>Electrolytic Conductivity (Resistivity) (Proposed)</td>
<td>0.056 uS/cm to 147 uS/cm</td>
<td>Joe Petersen, Abbott Laboratories</td>
<td>(947) 938-9109</td>
<td><a href="mailto:jpcpetersen@abbott.com">jpcpetersen@abbott.com</a></td>
</tr>
<tr>
<td>Humidity (Proposed)</td>
<td></td>
<td>David Krucker (Sandia Labs)</td>
<td>(505) 844-5944</td>
<td><a href="mailto:ddkrucker@sandia.gov">ddkrucker@sandia.gov</a></td>
</tr>
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</table>

If you know of corrections to the above table let me know.

The Mass ILC final report was disseminated by Jim Ross (Quality Control Services) email:

< Lab@qc-services.com >. NIST software was used to generate the final report. Two 1 kg artifacts were used in the ILC. Quality Control Resources did the analysis. Jim reports that Quality Control Services is the pivot lab for the WRAP 100 g to 1 mg round robin. Jim is interested in starting another ILC in Jan 2003. Contact him if you are interested.

John Cable, Honeywell FM&T, <jtcable@kcp.com >, coordinates the IEEE Microwave Theory and Techniques - Automatic RF Techniques Group (ARFTG) round robins in support of automatic network analyzers. The following connector types are supported in the round robin effort. Thanks to John Cable for providing this information. Note the new 7-16 connector.

**ARFTG MCP ILC Points of Contact:**

- **2.4 mm connector.** Bart Schrijver, Agilent Technologies. Phone (707) 577-2495, FAX (707) 577-5484, e-mail < bart.schrijver@agilent.com >
- **2.92 mm/K connector.** Gilbert Perez, Anritsu. Phone (408) 778-2000 ext. 4930, FAX (408) 778-4010, e-mail <gperez@nang.us.anritsu.com >
- **3.5 mm connector.** Phil Yates, JPL. Phone (818) 393-3705, FAX (818) 354-8153, e-mail <pyates@jpl.nasa.gov >
- **GPC-7 connector.** You-Song (Brian) Lee, Anritsu. Phone (408) 778-2000 ext. 4976, FAX (408) 778-4010, e-mail < bs.lee@anritsu.com >
- **7-16 connector.** Greg Burns, Northrop Grumman. Phone (410) 765-7331, FAX (410) 765-7370, e-mail <burns.john@postal.essd.northgrum.com >

Type 'N' connector, John Cable, Honeywell FM&T. Phone (816) 997-4361, FAX (816) 997-3803, e-mail <leftside@kcp.com >[ARFTG MCP Com.Ch.]

John Cable also reports that ARFTG is looking into the possibility of getting together 1.85 mm & 1 mm MCP kits.

ARFTG is working to re-write and update the instructions for the kits with an effort to do a better job of explaining the measurement convention (connector on port).

ARFTG are also going to try and automate the submission of the data files through a web-based script system. They currently e-mail data files to NIST and (with the proper formatting) can expect to see the results returned in one to two days. Our biggest problem has been getting everyone to format the data properly.

**Proposed New ILCs**

Tom Larson, NIST, < thomas.larason@nist.gov >, announced the need for a new UV ILC. Tom coordinated a UV ILC in the early 1990s. The proposed MCP is a 365 nm Irradiance and will be limited to 20 laboratories using a modified petal pattern.
Joe Petersen, Metrology Engineer at Abbott Laboratories informed me that he would like to start an Electrolytic Conductivity (Resistivity) ILC. The range is 0.056 us/cm to 147 us/cm. The artifact is a conductivity meter(s) with flow through and dip cells. Joe would like to have approximately 6 to 10 participants. The anticipated start date would be 3Q 2002. Joe’s phone number is (847) 938-9109 and FAX is (847) 937-4634. <joe.petersen@abbott.com>

David Krukar, Sandia National Laboratory, is interested in coordinating a Chilled Mirror Hydrometer ILC for Humidity. Dave can be contacted at (505) 444-5944 or email: <dckruka@sandia.gov>. David is also interested in participating in ILCs in shock and acceleration/vibration.

There are 15 participants interested in a RF Power ILC. I will email those interested with an email survey.

Interested Participants:

Fred S. King <fking@kelilabs.com>, QA Manager at Kimball Electronic Laboratory Inc., is interested in participating in future ILCs in measuring Gage Blocks, and DC resistance.

TestEquity Inc. is interested in participating in AC/DC Current and Voltage and Resistance ILCs. Contact Tim Holder, Quality Assurance Coordinator TestEquity Inc. Phone Tim at 805-498-9933 x134, FAX 805-498-3733 or email <tinh@tsetequity.com>.

For more information about the NCSLI MCP Committee contact Jim Wheeler at (619) 545-9698, FAX (619) 545-9861 or Al Teruel at (619) 545-2857.

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INTRINSIC & DERIVED STANDARDS

John Ball

The Intrinsic and Derived Standards Committee continues to be very active and the committee held a meeting at MSC in January 2002. A summary of committee activities include:

1. Ruben Salazar and David Allen volunteered to provide information on the Pressure and Temperature working groups to be posted on the IDSC Website.

2. There was considerable discussion of the Catalogue of Intrinsic and Derived Standards, one of this committee’s key products. It is clear that several of the items listed in the catalogue don’t really fit our definition of a derived standard. The chairman agreed to discuss what should and should not be in the catalogue and whether or not to make it available as a free Web resource with VP Pettit. The question of how much money the catalogue generates will also be raised.

3. Bob Hardy reported on his international adventures with RISP 5, a document gaining respect and influence. He also reported that he has detected a few errors in the RISP that need to be corrected. Because the errors are essentially editorial, he will send them into the NCSLI publishing contractor without review by committees.

4. In a wonderful development, Stan Pond volunteered to re-start the TP Argon WG. It was agreed that, even if metal fixed points are rolled together into one WG and even if ASTM standards are adopted by IDSC, Argon is sufficiently different to need its own WG.

5. Ruben Salazar reported that changes to the existing pressure RISP will have to be made in the new NCSLI format. This entails additional work for the Pressure WG, which is beginning a revision. He will request an electronic copy of the current RISP from VP Pettit as a starting point. His WG will meet Wednesday and will discuss cross-floats, among other things, and he will send the IDSC chairman minutes. Expect a new version of the Pressure RISP soon.

6. The issue of ANSI was raised and discussed. At present no one was in favor of making our documents into ANSI standards. It was felt that the very speed and flexibility we enjoy in the committee would be casualties of such a union.

7. There was a discussion of "derived standard" meaning a primary standard that was not intrinsic. Many items in our catalog would not meet this definition, either. All of this points out the need to rework the Catalogue.

8. A new working group is needed to do this catalogue work. The chairman will contact potential volunteers, present and former members, seeking interest in participating. Ken Futornick of TEK tentatively volunteered to serve on the WG.

9. Chuck Ehrlitch serves on both VIM and GUM committees. He reported that the VIM Committee meets twice per year and is moving toward a revision that will hopefully be ready for review by mid-2003. The BIPM will coordinate. Good news so far is our Intrinsic Standards definition remains in the VIM, but the committee has issues with the notes.

10. Josephson Junction Interlaboratory Comparison: David Deaver reported on the new JJ ILC. All measurements have been completed for the 2002 intercomparison. This time there were no changes or improvements required for any of the participating labs. What substantially improved was the NIST link through the traveling JJ array. All measured differences among the participants fell within 2 parts in 100 of NIST, which demonstrates equivalence among participating laboratories. Certificates will be issued in consonance with NCSLI International that state "NCSLI Sponsored" and words regarding NIST connection, which will hopefully address potential concerns from accreditation agencies.

11. An attendee expressed his interest in grating-based interferometric laser transducers as intrinsic standards. No one present was ready to discuss this subject, but Dennis Swyt’s name was suggested as a resource.

12. On the subject of membership. The chairman is of the opinion that those who attend the meetings and participate in the committee’s work are the members of the committee and that our document should be changed to reflect this. This matter will be discussed with VP Pettit.

CONSENSUS STANDARDS

Tom Diven

Because of a lack of interest in this committee at this time, Tom and I have decided to cancel this committee until renewed interest is expressed in the future.

CHEMICAL METROLOGY COMMITTEE

Tom Quinet

The NCSLI Chemical Metrology Committee will not be holding a meeting in conjunction with PITTCON 2003 in Orlando, Florida, the week of March 9-14, as previously planned. The next scheduled meeting of the committee will be held in conjunction with the NCSLI Workshop & Symposium the week of August 17-21 in Tampa, Florida.
Abstracts are currently being accepted for the 2003 NCSLI W&S; the deadline for submission is December 16, 2002. Please refer to the instructions for submitting abstracts on the NCSLI website.

<http://www.ncsli.org/conference/2003/> It is expected that there will be two chemical metrology sessions held during the workshop.

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DOCUMENTARY STANDARDS APPLICATIONS
Larry Nielsen, VP

LABORATORY EVALUATION RESOURCES
James Crane

No Q3 report submitted but Jim may be changing positions or moving to a new employer soon and may be unable to continue to serve as chairman. This committee may benefit from some spill-over projects and participation from the 174 committee.

LABORATORY FACILITIES
Dr. David Braudaway

No Q3 report submitted but the committee’s number 2 goal for 2003 (NL articles on facility design) is on indefinite hold, pending availability of the promised source material.

METROLOGY PRACTICES
Dr. Howard Casterup

Calibration Intervals

Don Wyatt of Diversified Data Systems is working on data management models that will optimize the collection of data and the management of recall cycles. The identification and documentation of requirements for variables data interval analysis are in-progress.

Measurement Decision Risk Analysis

Karl Haynes is continuing development of material for presentation in a draft RP. It was agreed to include Bayesian methods at the August Committee meeting.

SPC Methods

Ricardo Nicholas of Boeing Defense & Space Group is continuing to manage development of a Metrology SPC RP. The new Gage R&R model is still under development.

Decision Support

Derek Porter, of Boeing Commercial Airplane Group, has been continuing his efforts to identify decision support guidance in existing NCSLI RPs. References to this guidance will be included in a draft RP for Metrology Decision Support.

WRITING COMMITTEE
Jesse Morse

The meeting in San Diego was very well attended, and there were enough members present for a quorum. We also enjoyed a good audience of observers who were given the floor several times during various discussions. The meeting contained reports by Dan Harper concerning the status of ISO10012, Doug Faison on the CASCO WG25 effort to revise 17025:1999, and Bill McCullough on TAG activity at ANSI/ASQ M1. There were also various membership changes that were addressed and voted upon.

The recorded minutes are being processed for access from the committee web page, and printed minutes are underway by our secretary, Del Knapp. They will be posted on the web as soon as they transcribed.

During the meeting I presented an update on the "stats" and activity surrounding the reaffirmation of Z540-1, and of Z540-2. We have been notified by ANSI that the reaffirmation of Z540-1 has now been approved. The nomenclature is changed to "ANSI/NCSL Z540.1-1994 (R2002)". The reaffirmation of Z540-2 is still at the Board of Standards Review (BSR).

I reported to the committee that with the reaffirmation of "-1" being imminent (now done), we should now be focusing on what will be done with it in 2007, which is the next expiration date. In fact, the process for action on "-1" should be begun with ANSI by 2006. The original motion, that was passed in Washington DC (NCSLI 2001), included a "promise" to ultimately modernize "-1". I set a goal during our meeting to establish a Working Group to develop a solid proposal to be presented to the committee at MSC 2003 for discussion and vote.

During our meeting I presented a first draft of a "Matrix" that would aid a person in moving from "-1" to 17025, aligning paragraphs and with comments. Basically, it is the work done by WG-1 in 2000 during the 17025 adoption process. This is a document that is very much needed, and is being requested by our constituents. After much discussion, I agreed to send each member a copy of the draft and requested they provide further comments as to the differences between the two standards. That has been done, and the comment period is closed. Doug Sugg (Vice Chair) volunteered to compile the inputs and produce a second draft for the committee to review. The second draft is done, and is being prepared for delivery to the members by email. The goal is to make this document available via our committee web site before MSC 2003.

During the course of gathering input to the "Matrix", much good dialog concerning where to go with the next standard occurred. I am attempting to compile that dialog into a work document for the working group to be established.

Continuing to comply with ANSI's requirement to communicate the activities of the committee, I have published an article in the NCSLI Newsletter this quarter describing the reaffirmation of Z540.1-1994 (R2002).
Committee News

ACCREDITATION RESOURCES
James Jenkins

Laboratories Capabilities

The revised final draft of RP-9, "Laboratory Capability Documentation Guidelines" has been circulated one more time to all committee members for final review. All final comments and suggestions from the committee are to be submitted within 4-weeks. Then, the document will be passed forward for proofing, review, approval and publication.

Web Site Development

The long-term goal of developing an interactive Accreditation Resources page with information and links to resources will now be able to be started. Although a lot of improvements have been made to the website, the ability to work on the site and then submit the information to the business office for publication needs to be completed. This project will be addressed at the next committee meeting.

CALIBRATION/VERIFICATION PROCEDURES
Dale Varner

The Calibration/Certification Procedures Committee met at the NCSL International Conference in San Diego, California in August 2002. We had a very good meeting and accomplished numerous items on our action item list.

At press time:

AUTOMOTIVE COMMITTEE
Tom Kypta

The Automotive Metrology Committee held their fall meeting on Friday, December 13, 2002, at the BorgWarner Powertrain Technical Center, Auburn Hills, Michigan. Discussion included ISO/TS 16949, Section 7.6 and portions of ISO 17025.

Of concern to the committee is a note in ISO/TS 16949 inferring that compliance to ISO 17025 is not required, but that accreditation to ISO 17025 would satisfy the requirement of ISO/TS 16949. Further investigation of the standard by the committee to better understand its intent will follow.

The committee expressed interest in determining the acceptance of sharing laboratory standards, and procedures within organizations at different geographical locations, and supporting activities at those locations. This would provide better utilization of laboratory standards, increasing the scope of some laboratories, and improve measurement interoperability within the organizations.

Currently most organizations are supporting activities only at the geographical location of the calibration laboratory, building, or campus. It has been perceived by members of the committee that accreditation to ISO 17025 would be required to support activities within an organization not at the same geographical location of the captive laboratory.

At a press time:

We're pleased to see the automotive committee getting underway.
CALL FOR PAPERS-2003 NCSLI CONFERENCE IN TAMPA

August 17 - 21, 2003
Theme: The Spectrum of Metrology: From the State-of-the-Art to the Everyday.

Share your knowledge with the Metrology Community. Be a Presenter.

In 2002, approximately 130 speakers volunteered their time and expertise to give a paper at the annual workshop and symposium.

Although the formal Closing Date for abstracts was December 16, 2002, if you have material which might qualify for a paper, there are often open places which develop, so the organizers like to have substitutions. You might request an extension by contacting:

<callforpapers@ncsli.org>
303 440 3339
FAX 303 440 3384

NEW BOOK---THE UNCERTAINTY OF MEASUREMENTS
Physical and Chemical Metrology: Impact and Analysis
by S.K. Kimothi

Published by the ASQ Quality Press, this comprehensive guide shows the importance of metrology while explaining the science of the uncertainty of measurements. The author shows how the accuracy of measurements affects all of us in trade commerce, safety, health care, environmental protection and more. External and internal customers, along with regulatory agencies, often prescribe measurement accuracy requirements.

Newcomers to metrology will find Kimothi's explanations easy to follow because of the comprehensive introduction to the basic principles of reliable measurements. He includes information about current events and how the uncertainty of measurements affects trade, Six Sigma, and more.

Topics include:
- Guide to the Expression of Uncertainty in Measurements (GUM) approach
- A chapter on calibration and measurement traceability
- Statistical techniques in metrology
- Examples of measurement data and random variables
- Probability density functions
- Sampling distribution
- Statistical estimation of degrees of freedom and regression
- Evaluating various uncertainties using several approaches of international consensus
- Measurement errors and calibration laboratories

Contact:
Quality Press
600 N. Plankton Avenue.
Milwaukee, Wisconsin 53203.
800 248 1946

List price of the book is $65, and ASQ member price is $52.

More information is available from ASQ at
<http://qualitypress.asq.org/perl/catalog.cgi?item=H1112>.

Editor's Note: Author Kimothi is our new NCSLI Region Coordinator for Delhi, India.

NPL MEASUREMENT PROGRAMME BENEFITS SMALL UK MANUFACTURERS
Nigel Milton, UK Region Coordinator

A groundbreaking British government initiative is making better measurement popular and profitable for small companies, under the support of the National Physical Laboratory (NPL). Their On-Machine Measurement Project started modestly with three small pilot programmes for companies engaged in engineering manufacturing, the aerospace supply industry and the automotive supply chain. It is now expanding into new and diverse sectors in the UK, from printing and electronics to food & drink and healthcare. It has elements of the well-known US NIST Technology Transfer Projects.

On-Machine Measurement enables and encourages free trials of new process control and measurement equipment within small and medium sized companies. The project team identifies companies' measurement equipment needs, develops a business case, coordinates with instrumentation manufacturers and then provides training and support to small and medium sized enterprises (SMEs) while the equipment is on trial.
At the end of the trial the results of the impact of the equipment were calculated and presented to the company, who had the option to purchase or return the equipment.

For more information see <www.onmachine.co.uk> or contact Mick Capps of On-Machine Measurement Ltd at +44 1924 254 242 or Paula Kness of NPL at 020 8943 6329.

THE FIRST THING WE SHOULD DO IS TO STANDARDIZE THE LANGUAGE

Editor's Note: Mike Hutchins, who manages the Agilent Metrology website, noted my comment in the caption of Andrew Wallard's Keynote text in the October issue, where I jokingly suggested a BIPM project to standardize the "English" language. Mike referred me to this Mark Twain story on Agilent's website.

The intent of international "standards" is to facilitate consistency and common interpretation, so it's amusing that documents written using British English have to be "translated" into American English when they're adopted over here. We need a standard language. Mark Twain believed many problems would be overcome by eliminating the redundancy in the construction of the English language. After all, do we really need 26 letters in the alphabet? In doing so, his resultant language sadly typifies the way many people view and understand "standards" today!

Caution: If any variety of English is not your native tongue, you may find this difficult to follow. Even native Brits find it difficult...

A Plan for the Improvement of English Spelling by Mark Twain

In Year 1, that useless letter c would be dropped to be replaced either by k or s, and likewise x would no longer be part of the alphabet. The only case in which c would be retained would be the ch formation, which will be dealt with later.

Year 2 might reform w spelling, so that which and one would take the same consonant, while Year 3 might abolish y replasing it with i and bear 4 might fika the g/j anomaly worse and for all. Generally then, the improvement would continue bear bear with bear 5 doing away with the useless double consonants and bear 6-12 or so modifying vowelz and the remaining voiced and unvoised consonants.

Bai bear 15 or so, it wud fainali be possible to meik itus ov the ridi­
dant leter c, y and x -- ba now jast a memor in the mainz ovould dober -- tu riples ch, sh and th rispektivli.

Fainali, sen afeie sam 20 iers ov orsogreffr reform, wi wud be a lojikl, kohint speling in ius xrewawt xe Ingli-spikin world.
Surfaces and Their Measurement by David Whitehouse is a new book with insights into issues that currently envelop surface metrology. Surface metrology is far more complicated than it needs to be, according to Whitehouse, because the technology is cluttered with redundant parameters the came out of an evolving science of surface characterization and retained by dated industry standards. He concludes that integrated or averaging parameters are best for general use and most of new parameters should be used for special purposes such as machine tool diagnostics.

Yet, the situation may not be that simple as shown by his chapters highlighting unique facets of surface measurements for errors of form, roundness, cylindricity, etc. The clutter of parameters is preserved by standards that served as melting pots for ideas promoted by widely divergent groups. The current standards are a mix of parameters designed by manufacturers concerned about part quality, mathematicians concerned about statistical calculations, electronic engineers concerned about analog wave forms, and others.

A key issue for Whitehouse is the dichotomy of uses for surface parameters. Is surface metrology a measurement used to control processes or a functional property of the completed workpiece? The use of areal analysis, with its new parameters focused on areas rather than linear profiles, may help clarify the issue, but will also contribute to further clutter of parameters.

To Whitehouse, who has spent 40 years in metrology research and teaching, manufacturing has overlooked the function of surfaces in metrology putting it secondary to a vague requirement that surfaces must be as good as possible. Changing demands of manufacturing don't make matters easier for instrument makers. As components become smaller and tolerances tighter, dimensional limits approach the level of surface features and exceed the capabilities of existing measurement techniques. While it's easy to reduce part sizes, it's far more difficult to shrink surface features proportionally.

Instrument makers are faced with designing new tools to work in scales of measurement that differ by factors as large as 50,000 to 1. In addition, new instruments for work at submicron dimensions must compensate for molecular forces and energies that were insignificant for macro scale metrology. Whitehouse discusses international standards that are an essential part of a global marketplace. Items that need to be resolved include N systems, parameter classifications that use large values for rough finishes in one country and smooth in another.

See the website <www.abrasivesmall.com> for a table of contents and other details.

Surfaces and Their Measurement, David Whitehouse, Hermes Penton Science, 2002 ISBN 1 9039 9601 5, $123 include shipping from the Abrasives Mall. 724 282-6210
NIST DIRECTOR: 'STREAMLINING STANDARDS WOULD IMPROVE SECURITY'

Streamlining the voluntary standards process and decision making would benefit the nation in the area of security standards-and more broadly," said NIST Director Arden Bement at a World Standards Day event in Washington, D.C., on Oct. 16, 2002. World Standards Day is an annual international celebration to raise awareness of the importance of global standardization to the world economy.

Streamlining the process would have spillover benefits in terms of trade and adoption of U.S. technologies, Bement asserted. He noted that the United States is in "a standards system competition with others, especially the European Union (EU), and we need to make sure that our system is as nimble as possible if we are going to make it attractive to emerging economies."

What is not clear is whether or not industry executives understand the importance of the voluntary standards process in adopting improved security products and practices, Bement said. He noted, "we still have a long way to go in communicating the importance of the standards process."

The full text of Dr. Bement's remarks is available online at <www.nist.gov/speeches>.

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NRC REPORT PRAISES NIST LABS FOR SCIENCE, SERVICE AND STAFF

The seven laboratories of NIST received high marks for technical merit, responsiveness to customer needs and staff capabilities in a recently published report by the National Research Council (NRC) Board on Assessment of NIST. The report, which documents a process of assessment that began in December 2001, details the board's conclusions on the overall state of the laboratories as a unit, as well as in-depth reviews of each individual lab.

In its report, the NRC board states that "the technical merit of the laboratories' work remains high" and that "the breadth and depth of the laboratories' technical talent allow NIST to respond to customer needs, whether anticipated or unanticipated." On the latter, the board specifically noted the agency's efforts in the area of homeland security, praising NIST's "ability to direct resources to technical investigations required by the terrorist attacks of fall 2001."

Highest praise went to the NIST technical staff, whom the board called "NIST's most impressive resource." The board stated that it "... is continually impressed by the exceptional technical capabilities of NIST researchers, by their dedication to their work, and by the good morale generally evident throughout the institution."

The board addressed a number of opportunities for improvement for the NIST Laboratories, including recommendations for more use of strategic planning, increased sharing of best practices among the labs, and better resource planning to ensure the skills and equipment to meet future customer needs.


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PACKING JUNCTIONS IMPROVES PROGRAMMABLE VOLTAGE STANDARDS

The NIST has led the way in the development of programmable direct current (DC) and alternating current (AC) voltage standards for use in calibration laboratories. The standards have been constructed of superconductor/normal metal/superconductor Josephson junctions because of their reproducibility, stable voltage steps and immunity from noise. Now, to improve the quality of the standards, NIST's Electromagnetic Technology Division is packing the junctions as densely as possible in three dimensions with junctions separated by a distance of only 20 nanometers (approximately 1/50 the diameter of a red blood cell).

NIST determined that the most effective method for packing the junctions is to stack them in double-barrier and triple-barrier sandwiches using molybdenum-disilicide or titanium as barrier materials. These materials were chosen because they can be reactive-ion etched in contrast to standard palladium-gold barriers which must be wet etched in dilute acids. Their microwave response shows that the arrays of junction stacks have excellent uniformity. NIST estimates the maximum number of barriers in a junction stack will be limited by vertical etching uniformity and heat dissipation. NIST researchers are continuing to improve the vertical etch process and increase the number of junctions in each stack.

For technical information about these developments, contact Samuel P. Benz, (303) 497-5258, <benz@boulder.nist.gov>.

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NIST RESEARCHERS APPROACH NON-PHYSICAL STANDARD FOR KILOGRAM

Scientists at the NIST love precision. Yet one group of the agency's researchers is going to extremes, even by NIST standards. They run air conditioning (AC) in from an adjacent building since AC causes tiny vibrations that could disturb their work. They favor an isolated building that includes much wood construction because wood does not cause minute warps in magnetic fields. They do all this because they are working on a truly weighty matter: redefining the kilogram.

The world's measurement authority, the International System of Units (known as SI), includes seven basic units that define how we quantify things such as time, length and temperature. The kilogram represents the "final frontier" for the SI because it is the only unit still based on a physical standard—a century-old platinum-iridium cylinder stored in France. The other units are based on unchanging physical phenomena such as the speed of light.
To measure gravitational frequency shift, comparisons will be made with these exact measurements and the known equivalence of electrical and mechanical power, NIST’s kilogram team relates mass to electrical units.

Contact: Philip Bulman, (301) 975-5661.

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NIST HELPING PREPARE AN 'OUT OF THIS WORLD' ATOMIC CLOCK

Setting the world's clocks from a timepiece far above the Earth someday may be the norm if the NIST-led program to put an atomic clock aboard the International Space Station (ISS) proves successful. This is part of the NASA-funded Primary Atomic Reference Clock in Space (PARCS) mission, scheduled to fly on the ISS in early 2006.

PARCS will be used to test gravitational theory, study laser-cooled atoms in microgravity and explore ways to improve the accuracy of timekeeping on Earth.

Atoms in microgravity can be slowed to speeds significantly below those used in atomic clocks on Earth, providing a predicted 10-fold improvement in clock accuracy. (The current U.S. standard, the NIST-FI clock, is accurate to within one second in 30 million years.) The PARCS space clock will be compared continuously to the hydrogen maser, a fundamentally different clock, to provide a test of an Einstein theory that predicts that two different kinds of clocks in the same environment will keep the same time.

To measure gravitational frequency shift, comparisons will be made between the space clock and a clock on Earth. Signals conveyed to the ground from such space clocks someday might serve as an international standard available to anyone around the world.

PARCS is a cooperative effort involving NASA's Jet Propulsion Laboratory (JPL), NIST, Harvard-Smithsonian Center for Astrophysics, the University of Colorado at Boulder, and the University of Torino in Italy. JPL is leading the actual development of the space package.

Contact: Fred McGahan (Boulder), (303) 497-7000

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NIST RESEARCH FINDS WAVEGUIDE LASERS OFFER ADVANTAGES

Waveguide lasers are compact with low noise, relatively high output powers, and long upper-state lifetimes, allowing them to be easily integrated with optical-fiber-based systems. Although NIST scientists do not expect waveguide lasers to replace fiber and semiconductor lasers in communication applications, waveguide lasers provide a number of advantages over traditional laser sources.

For example, single-frequency waveguide lasers provide narrow linewidth and high-output power in a compact package, which makes them better suited than fiber lasers or extended-cavity semiconductor lasers for applications such as remote sensing, wavelength division multiplexing (WDM), all optical RF photonics, and mobile laser platforms.

Mode-locked waveguide lasers, used in high-data-rate communications and photonic A/D conversion, provide short pulses with low jitter and high-average power and avoid the effects of supermode and pattern noise found in-harmoically mode-locked fiber lasers. Also, mode-locked waveguide lasers operate at repetition rates unsuitable for mode-locked semiconductor lasers.

For more information on NIST research looking at the advantages of waveguide lasers, contact Bert Callicott, (303) 497-5952, <bertc@boulder.nist.gov >.

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NIST MICRO-POSITIONER MAY HELP SEND MESSAGES FROM THE STARS

Phoning home from 93 billion miles away—out E.T. and other science fiction characters can do that. But with the help of NIST know-how, reality soon may catch up with imagination.

Conceptual designs for a "realistic interstellar explorer," or RISE—a highly autonomous craft that would travel far beyond this solar system to collect scientific data—call for a laser-based communications link to Earth that relies in part on a recent NIST invention called a Parallel Cantilever Bi-axial Micro-Positioner. The prototype NIST device acts as a mechanical filter that generates very straight lines by screening out all other motions. Primarily intended for use in the delicate assembly and alignment of optoelectronic devices and applications in micro- and nano-manufacturing, the micro-positioner in a different application offers a promising means for meeting the demanding range, mass and power requirements for the RISE.

In its interstellar role, the micro-positioner would be used to position a lens that steers a laser beam communication link toward Earth. The beam must be pointed precisely because the distances involved would be, well, astronomical. The RISE is envisioned as having a range up to 1,000 Astronomical Units (AU)—1,000 times the distance from the Earth to the sun, or 93 billion miles [5.8 light-days].

A recent paper by researchers at NIST and Johns Hopkins University Applied Physics Laboratory (which is designing the RISE) concluded that an optical communications downlink spanning 1,000 AU is technically feasible if these new technologies can be sufficiently refined. For example, the current range of the NIST micro-positioner would have to be improved by a factor of nearly 10.

Contact: Laura Ost, (301) 975-4034.
NIST 'HOT' MOVIES HELP OPTIMIZE SENSORS

It will never run in theaters, but this colorful movie has a cult following all the same.

The "thermal contour" movie reveals what happens to a microhotplate-an NIST-developed technology that shows promise for a variety of gas-sensing applications-when it is heated and cooled. The devices are attractive for use in low-cost gas sensors, which might be used, for example, to detect freshness of food products or the leakage or presence of harmful chemicals.

The small size and fast heating speed of these tiny, micromachined devices previously made it difficult to measure dynamic temperature distribution, so NIST researchers use a new high-speed transient thermal imaging system (originally developed by NIST to study heating in power semiconductor devices) to make the movies.

The imaging system collects temperature information every microsecond for each 15 micrometer (0.006 inch) square of space on the microhotplate. The system works by successively acquiring temperature response as a function of time at each coordinate of the device being tested, and by using a coordinate-translation scheme to move between points. The thermal responses at different points are reconstructed to make the thermal contour movie.

Contact: Michael Newman, (301) 975-3025.

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NIST IMAGE LIBRARY TO HELP IMPROVE LINEWIDTH MEASUREMENTS

Imagine trying to make absolutely critical measurements for semiconductors using instruments that do not quite measure up. That's the challenge currently faced by those needing accurate measurements of the "critical dimension" or CD-the smallest size that can be etched onto a computer chip uniformly. In the semiconductor industry, CD is synonymous with the measure of linewidth.

Linewidths are generally determined using an image generated by an instrument such as a scanning electron microscope (SEM). The pattern of light and dark in an image results from a complex interplay between the microscope and the sample's shape, composition and other properties.

Unfortunately, lines with different sidewall geometries appear to have different widths when measured using algorithms that are standard on current CD-SEMs. In other words, sidewall variation masquerades as width variation, yielding an inaccurate measurement.

To help resolve the situation, the NIST is developing a method of determining linewidth and lineshape from a library of top-down SEM images (the top-down measure is widely used).

NIST's new method explicitly accounts for the physics of the interaction of the SEM's electron beam with the sample as well as the effect of sidewall geometry. The approach entails performing calculations in advance for many different shapes to learn what images will be produced-information that can be used to form a library, or database, of actual sample shapes and calculated image pairs.

Unlike scatterometry, where measurements are averaged over a relatively large target, the NIST technique relies on an SEM's higher resolution to yield a more localized measurement.

In early tests, NIST researchers have compared measurements using this method to cross sections of the same lines. Agreement for linewidth was within one or two nanometers, and within one- or two-tenths of a degree for wall angles. Measurement repeatability also was significantly greater than with current methods.

Contact John Villarrubia, (301) 975-3958, <john.villarrubia@nist.gov>.

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A NOTARY PUBLIC FOR THE DIGITAL AGE

Traditionally, when you need a document authenticated, you take it to a notary public, a person licensed to affix an official seal, date and signature to it. But what about electronic documents or files? Thanks to NIST physicist Judah Levine, there may soon be a solution.

Levine, a researcher in NIST's Time and Frequency Division, recently received a patent (no. US 6,393,566 B1) for a system that applies a signed time stamp to any digital file, proving that it existed at a certain date and time in a specific form. The time stamp in the signature is traceable to the NIST time standard. Any user can verify the authenticity of the file and its time stamp. The authentication procedure does not require NIST participation, and NIST does not need to maintain a copy of the original file. If the file or original NIST time stamp have been altered in any way since the NIST signature was applied, the authentication process will fail.

Among the many situations where the NIST electronic time stamp might be used are the processing of time-critical commercial transactions such as bills of sale or legal matters such as contracts and wills. It also may be used to establish authorship and date of creation for digital audio and digital video recordings, and to support services similar to registered mail with return-receipt requested.

Contact: Fred McGehan (Boulder), (303) 497-7000.

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NIST DETAILS FEDERAL INVESTIGATION OF WTC DISASTER

On Aug. 21, 2002, the NIST detailed its $16 million, 24-month federal building and fire safety investigation to study the structural failure and subsequent progressive collapse of several World Trade Center (WTC) buildings following the terrorist attacks of Sept. 11, 2001, in New York City. The study of WTC Buildings 1 and 2 ("The Twin Towers") and WTC Building 7 will focus on the building construction, the materials used and all of the technical conditions that contributed to the outcome of the WTC disaster.

NIST already has completed much of the planning work for the investigation and has consulted extensively with the public concerning its scope. Recent passage of an emergency supplemental appropriations bill now enables NIST to move ahead with the study.
The objectives of the NIST investigation are to determine technically:

- why and how WTC Buildings 1, 2 and 7 collapsed following the initial impact of the aircraft;
- why the injuries and fatalities were so low or high depending on location (by studying all technical aspects of fire protection, occupant behavior, evacuation, and emergency response);
- what procedures and practices were used in the design, construction, operation and maintenance of the WTC buildings; and
- which building and fire codes, standards and practices warrant revision and are still in use.

NIST expects to complete its investigation and issue a final report within an estimated 24 months from the start of the program. The investigation is part of a broader NIST response plan to the WTC disaster. In addition to the investigation, NIST is planning to conduct two related programs concurrently:

- a multiyear research and development program to provide the technical basis for improved building and fire codes, standards and practices, and
- an industry-led dissemination and technical assistance program that will provide practical guidance and tools to better prepare facility owners, contractors, designers and emergency personnel to respond to future disasters.

For details of the NIST WTC investigation plan, fact sheets, downloadable visuals and other information relevant to the project, go to <http://wtc.nist.gov>.

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NEW NIST MEASUREMENT SYSTEM MAY HELP SAVE POWER AND DOLLARS

Thanks to the NIST, manufacturers of transformers used in the transmission and distribution of electric power now will be able to meet proposed federal regulations for efficiency that should yield dramatic energy savings.

The U.S. Department of Energy (DoE) has mandated the labeling of energy efficiencies on electrical appliances for years. In a similar action, DoE is proposing high-efficiency standards for some transformer equipment to reduce the amount of electrical energy lost as heat in the transmission of electrical power from the generating plant to the consumer. Studies estimate that these regulations ultimately could result in an annual savings of several hundred million kilowatt-hours and several million dollars.

With the new regulations, transformer manufacturers must achieve compliance while keeping production costs down. Additionally, a number of smaller manufacturers are concerned about their meager budgets for testing and a lack of measurement expertise necessary to demonstrate compliance. NIST, collaborating with the industry, has alleviated those problems with the development of a specialized power loss measurement system needed for testing transformers. The system, controlled by a laptop computer, precisely measures the electrical input and output and determines the small differences between them—the amount of energy lost in the equipment.

A key conclusion of the research: high-precision testing can be done with portable equipment made inexpensively with off-the-shelf components.

In addition to developing the power loss measurement system, NIST partnered with the National Electrical Manufacturers Association (NEMA) and DoE to develop the standard procedures for its use. NIST soon will make the complete measurement system specifications available to manufacturers so that they can make and use the testing equipment in their own plants.

Contact: Philip Bulman, (301) 975-5661.

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NIST TESTING HELPS ENSURE ACCURATE LASERS FOR SURGERY, CHIPS

When it comes to the perfect application for excimer lasers, the eyes have it. Excimer lasers (lasers that produce short bursts of energy) are used widely to perform LASIK and PRK vision correction surgery. They also are important in the production of computer chips.

To create excimer lasers that are suitable for precision applications like eye surgery, manufacturers must measure accurately the amount of laser power and pulse energy their devices emit. Energy detectors are used for this evaluation; however, if the detector has problems with non-linearity (deviation from the correct measurement depicted graphically as a curving away from a straight line), the readings will be too high or too low.

Help for this problem is available from the NIST, which now offers a service to test the non-linearity of excimer laser energy detectors. This service provides an accurate measurement of a detector's response over a large energy range.

Most detectors cover an energy range that is too large to be measured at any single energy level. Testing of typical detectors shows non-linearities as large as 8 percent. In addition to inherent non-linearities, other electronic effects (such as range discontinuity and background) can contribute to the non-linearity of the detector.

NIST is now offering detector non-linearity measurements at the exact wavelength of the excimer laser, 193 nanometers, pending full documentation. Additional excimer wavelengths will be added to this service in the near future.

For more information on NIST's testing service for excimer laser detectors, contact Maria Dowell, (303) 497-7455, <maria.dowell@nist.gov>.

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NIST HELPS MAKE CRIMINAL HARD DRIVES BECOME 'HARD EVIDENCE'

The information technology revolution has changed how we do practically everything. Unfortunately, it also has changed how criminals make our lives miserable, with crooks using computers to commit fraud, steal identities and even lay the groundwork for kidnapping. Fortunately, a project in progress at the NIST soon may help law enforcement agencies turn the tables on these felons using their own computers.
The clues for piecing together the acts of the computer-assisted crime are often lurking deep in the criminal’s computer hard drive. Law enforcement officers must acquire the contents stored there before an investigation can take place. This is accomplished through the use of “image tools”-automated software programs that make an exact replica of the information or files stored on the hard drive.

Increasingly, defense attorneys are challenging image tools in the courts by arguing that the product does not work as advertised. There have even been claims that image tools actually alter the computer files during the imaging process.

Computer scientists at NIST have set up a testing program that evaluates image and write blocker software to precisely assess how well these tools function. The goal of the Computer Forensic Tool Testing project is to provide the law enforcement agencies with the documentation they need to assure that recovered digital evidence stands up in court.

The Computer Forensic Tool Testing project is funded by the National Institute of Justice, the research arm of the Justice Department, and managed through NIST’s Office of Law Enforcement Standards.

Contact: Philip Bulman, (301) 975-5661

NEW STANDARD HELPS MAKE SOFTWARE EASIER TO USE

Nothing drives people more crazy than software programs that are poorly designed, inappropriate for specific tasks and, in general, difficult to use. Employee frustration, wasted work time and decreased productivity attributable to software that isn’t usable can be costly for both businesses and individuals.

To help remedy the problem, computer scientists at the NIST teamed with U.S. companies to develop a standard way to test and evaluate software usability. The product of the team’s effort, the Common Industry Format (CIF) for Usability Test Reports, recently was approved by the American National Standards Institute (ANSI).

Several pilot studies by companies such as The Boeing Co., Oracle Corp. and Microsoft Corp. have verified the new standard’s usefulness. In fact, aerospace manufacturer Boeing partnered with Oracle, a large supplier of database products, to conduct joint tests of the CIF. This has resulted in software that both companies agree is more effective.

Now that the value of the CIF has been demonstrated, NIST is considering expanding its work to focus on improving usability of next-generation computer devices such as handhelds.

To learn more about the CIF, go to <www.nist.gov/iuser>.

NEW NIST TOOL HELPS SMALL BUSINESSES PROTECT IT SYSTEMS

Protecting electronic information and data is vital to the success of any company. But, small businesses are especially vulnerable because they often do not have the staff or resources to constantly monitor their information technology systems.

The NIST e-Scan Security Assessment is an online diagnostic tool that can assist small businesses in determining how well their company’s information technology systems are protected against failure or intrusion. The e-Scan tool also will provide recommendations to correct security problems. The tool is available free-of-charge at <http://escan.nist.gov/sat/index.nist>.

The easy-to-use tool asks a series of questions in 11 critical security areas, including computer virus protection, computer system physical environment, potential computer system mechanical failures, back-up policies and procedures, and IT contingency planning. Once the assessment is completed, the tool provides a report that specifies how well a business scores in all 11 of the areas and provides suggested improvements.

For more information on the e-Scan tool, contact Rick Korchak. (301) 975-8823, <richard.korch@nist.gov>.

NEW NIST REFERENCE MATERIAL BENEFITS USERS OF RAMAN SPECTROSCOPY

The capability to identify chemical substances easily and accurately at a crime scene or other location outside a laboratory, without handling the material or opening containers, would be a boon for many in science. A new NIST standard that reduces calibration costs as much as 20-fold represents a major step toward making such a tool practical.

A small piece of chromium-doped glass, Standard Reference Material (SRM) 2241 will enable users to calibrate the output of Raman spectrometers, long used in basic research and now drawing broader interest as components get cheaper. Raman spectroscopy reveals the chemical composition of a sample by illuminating it with a laser and then identifying color changes in a very small amount of the scattered light. The technique is simple enough to use in the field, and unlike some competing methods, can be used to measure samples through transparent containers.

Currently, full calibration of these instruments is so expensive that many Raman spectrometer users skip it and, therefore, may get inaccurate results. Intensity calibration equipment costs as much as $10,000; a NIST calibration costs about $2,000 and needs to be redone regularly. By contrast, the new SRM costs about $500 and can be used repeatedly.

Intended for use with red lasers (operating at 785 nanometers), SRM 2241 is the first in a series of four glasses that NIST plans to make for Raman spectrometers. These future SRMs will be designed for use with blue, green and near-infrared laser excitation, all of which are commonly used in research and industrial applications.
For technical information, contact Steven Choquette, (301) 975-3096, < steven.choquerr@nist.gov >.

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ATP PROJECT HELPS SOLAR ENERGY HOME OPERATE ON RIBBONS

In a new twist on the American dream, a "Zero-Energy Cottage" demonstrates how a homeowner might do away with those pesky utility bills.

The 160-square-meter (1,700-square-foot), two-bedroom, two-bath house features a number of environmentally friendly features including solar electric panels made by Evergreen Solar of Marlboro, Mass. The company developed an innovative approach to making its technology with co-funding from the NIST Advanced Technology Program.

Evergreen Solar makes solar panels—which convert sunlight to electricity—using a patented "String Ribbon" technique. Ultrathin crystalline silicon is produced directly from molten silicon, a streamlined process that avoids the waste and cost of slicing solid material blocks. String Ribbon yields more than twice as many solar cells per pound of silicon as typical methods, according to the company.

The three-year ATP project overcame significant technical challenges, including development of an active after-heater concept for precise control of thermal gradients and stresses in the silicon as it is formed and cools. Ribbon thickness was reduced from 300 micrometers (0.012 inch) to less than 100 micrometers (0.004 inch), while the width was doubled to 8 centimeters (about 3 inches). These thinner, wider solar-grade ribbons also can be grown faster with the after heater.

Contact: Jan Kosko, (301) 975-2767.

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NIST SOLVING A MYSTERY AMONG ELECTRONS

When it comes to sleuthing in science, few are better than the intrepid investigators at the NIST. For example, take the "Case of the Stray Electrons."

NIST researchers have created nanoscale devices that manipulate electrons in order to count them one at a time. Such counting is critical to the development of new fundamental electrical standards. When two electrons are bound in pairs (called Cooper pairs) in a superconductor, they can be manipulated much faster, providing larger currents that can be measured more accurately. Manipulation of Cooper pairs also is important in several schemes to develop quantum computers. Past attempts at manipulation, however, have been thwarted by the existence of a small number of unpaired electrons rambling around in the superconducting state. Avoiding these unpaired electrons is the mystery that NIST is now helping solve.

NIST researchers have uncovered an important clue by showing that a previously unappreciated factor has a strong effect on the number of unpaired electrons in Cooper pair devices. Electron counting devices are made from two layers of aluminum, where the strengths of the bonds pairing electrons in each layer can be different. The slight difference originally was thought to be unimportant. However, a study of more than a dozen devices in which this difference was varied in a controlled way and independently measured in each device, shows the difference does affect device performance directly.

Contact: Fred McGhan (Boulder), (303) 497-7000.

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TECH TRIVIA

• In 1946, NIST energy-conservation researchers estimated the fuel consumption of automobiles in terms of the types of vehicles and the characteristics of the roadways involved. Travel on expressways, arterial roads and local streets was considered, with the gas usage varying according to operating conditions. The study's authors concluded that such basic data could be used by urban planners to design transportation grids for maximum energy consumption.

• Nuclear physics was an important area of research at NIST in the post-World War II years. One of the first endeavors, starting in 1946, was in the field of tracer micrography, the tracking of the movement of radioactive atoms through organic and inorganic systems. As the newly formed Atomic Energy Commission made isotopes (such as phosphorus 32 and iodine 131) available to industry, research and medicine, NIST worked quickly to develop measurement standards to ensure their proper use.

• In 1949, NIST scientists created the nation's first primary neutron standard—consisting of a beryllium sphere with a radium bromide center—for the accurate measurement of the strength of neutron sources. In the absence of a standard, such measurements were accurate only about 20 percent of the time. Establishment and acceptance of the NIST standard facilitated the use of neutrons as a medical treatment and as a means of studying the structure of materials and biological organisms.
ASQ’s Certified Calibration Technician (CCT) program has been proceeding on its carefully laid-out plan, like a finely-crafted WWVB synchronized timepiece. To say a lot has happened with the CCT program since my last update would be an understatement. First and foremost, the long awaited CCT Body of Knowledge (BOK) document has been finalized and published.

Readers may remember that the BOK was developed from a series of workshops, phone interviews, mail surveys and many long hours of careful evaluation and analysis. The CCT BOK reflects the participation of hundreds of calibration professionals from industry, academia and government agencies. The BOK is divided into the following 6 major topics, each with their own subtopics and associated explanatory subtex:

• General Metrology (30 Questions)
• Measurement Systems (25 Questions)
• Calibration Systems (25 Questions)
• Applied Mathematics and Statistics (20 Questions)
• Quality Systems and Standards (15 Questions)
• Uncertainty (10 Questions)

Note: The CCT exam has a maximum time limit of four hours to complete the 125 questions.

Training / Education / Experience eligibility requirement for taking the CCT exam is a minimum five years of on-the-job experience in one or more of the areas of the CCT BOK. If you have completed a degree from a college, university, or technical school with accreditation accepted by ASQ, part of the five-year experience requirement will be waived, as follows (only one of these waivers may be claimed):

• Diploma from a technical, military, or trade school—two years waived
• Associate degree—two years waived
• Bachelor’s degree—two years waived
• Master’s or doctorate—two years waived

ASQ requires proof of professionalism before one can take the CCT exam. Proof of professionalism may be demonstrated in one of three ways:

• Membership in ASQ, an international affiliate society of ASQ, or another society that is a member of the American Association of Engineering Societies or the Accreditation Board for Engineering and Technology
• Registration as a Professional Engineer
• The signatures of two persons—ASQ members, members of an international affiliate society, or members of another recognized professional society—verifying that you are a qualified practitioner of the quality sciences

CCT exam question development began at the CCT Item Writing (IW) workshop conducted at ASQ headquarters in Milwaukee, WI on October 5-6 (ASQ refers to exam questions as items). This workshop was attended by 24 dedicated Metrology professionals and used the CCT BOK as the basis for developing multiple choice exam items. Exam items are required to be referenced to publications available in the public domain. The IW workshop yielded over 300 exam questions; each with a reference, answer key and written explanation for each multiple-choice item. These questions will be the focus of an Item Review (IR) workshop attended by 14 Metrology professionals scheduled for December 13-14 at ASQ headquarters. After the IR workshop each exam item will again be carefully analyzed for applicability, readability and technical correctness / reference publication linkage.

As previously mentioned, each CCT exam item must reference a publication that is available in the public domain. A listing of those references has been published on the ASQ website and is listed within each of the CCT major exam topics. This reference publication listing, as well as the CCT BOK, is not intended to limit the subject matter or be all-inclusive of what might be covered in an exam but rather is meant to clarify the type of content to be included in the exam.

Information about the CCT program, its BOK and reference publication listing, exam prerequisites, exam dates and the latest news updates may be found at:
< http://www.asq.org/cct/types/cct/index.html >
< http://www.measurementquality.org/cct/fs/cct.html >

A high-water mark for the CCT program occurred during the recent NCSLI board of director’s meeting. At the meeting it was decided to draft a letter of support for the CCT program with a strong recommendation for some form of "Hands-On" proficiency testing. Charlie Motzko, President of NCSLI, reiterated that "the Board supports the goal for the CCT program and encourages ASQ in this endeavor. We will assist wherever we can." Our ASQ hats are off to NCSLI for their vote of confidence and support for the CCT program.
**GIDEP METROLOGY**
Jim Carlton, Liaison Delegate

GIDEP Metrology Workshop 2002

A GIDEP Metrology Workshop was held in conjunction with the GIDEP Clinic on

7 November, 2002, at NSWC Corona Division, CA. There were about 20 attendees at this year’s workshop. A detailed discussion and demo of the internet metrology database, metrology data DVDs, utilization report, and data submission were presented from GIDEP.

The Navy calibration interval is only available to the Navy calibration lab due to the sensitivity of the data. However, Craig Stewart from the Measurement Science Directorate shared a very informative presentation on the Navy Calibration Interval Process with the GIDEP participants at the workshop. Blake Downing, lab manager of the Measurement Science Directorate Lab, gave an impressive tour of the newly-built metrology lab. Everyone at the metrology workshop enjoyed the tour. The workshop concluded with a very informative speech from Phil Painchaud, of Painchaud Consultants, on education in metrology.

**ISA INTERNATIONAL**
Mike Suraci, Liaison Delegate

I have continued to interface with the ISA.

They have been most cooperative in discussing issues such as Conference Management, Web Sites, Advertising and Training. We are fortunate to have the long-standing relationship with them that we enjoy.

ISA has forwarded an advertising package and promises once again to give us a “rock-bottom” price if we choose to advertise in their publication, “IN-TECH”.

**COUNCIL FOR OPTICAL RADIATION MEASUREMENTS**
Sally Bruce, Liaison Delegate

CORM 2003 will be held June 18 & 19, 2003, at SLAC Auditorium, Stanford Linear Accelerator, Stanford University. This will be the first CORM Conference on the West Coast. The theme for this year’s CORM is “Optics in the 21st Century: Latest Developments in Optical Measurements, Light Sources and Standards of the Lighting and Telecommunications Industries.” Registration information will be available on the CORM website at <www.corm.org>.
CORM had the kick-off meeting in September in Ottawa, Canada, for the CORM Eighth Report Committee. Dr. Richard Young <rjyoung@oIinet.com> is chair of that committee and membership is open to any CORM member.

Preparations for CORM 2004 are underway. CORM 2004 will be a joint conference with the ISCC and will be held at NIST Gaithersburg, in May 2004.

Call for Papers
CORM 2003
Optics in the 21st Century

Ed. Note: There was no deadline stated for this Call.

Contact:
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*NATIONAL ASSOCIATION FOR PROFICIENCY TESTING*
Gaylord DeGroot, Liaison Delegate

The number of Interlaboratory Comparisons/Proficiency Tests being offered continues to grow to satisfy the increasing demand. In some cases we have added additional artifacts, duplicating existing tests. New tests have been added, such as thread wires, plug gages, micrometer length standards etc. Presently we have ten new tests in development, based on customer need. On our website, <www.proficiency.org>, you will find an ILC/PT Wish List available for your input and comments. We use this to prioritize the development of our new and/or additional tests. We appreciate your input.

Many companies are looking for assistance in determining which ILC/PT's to participate in. This is in response to accreditation agencies requiring full coverage of your scope of accreditation. Give us a call and we will work with you to develop a schedule to cover your accreditation. We will help prioritize your tests based on criticality and urgency. Two- and three-year schedules can be established to include tests we have planned for development in the future.


*AMERICAN ASSOCIATION OF LABORATORY ACCREDITATION (A2LA)*
Ramona J. Saar, Liaison Delegate

A2LA Signs IAAC Recognition Arrangement

On October 24, 2002, A2LA joined INMETRO of Brazil and SCC of Canada in signing the newly established Inter-American Accreditation Cooperation (IAAC) Multilateral Recognition Arrangement (MLA).

The Inter-American Accreditation Cooperation is a relatively new regional cooperation of accreditation, certification and inspection bodies, as well as representatives from testing and calibration laboratories and other interested parties from countries in North and South America. Similar to APLAC and EA, IAAC's main objective is to facilitate commercial exchange among the member nations or blocs of nations in the economies it serves through a system of recognition arrangements of various types of conformity assessment bodies.

By signing the arrangement, A2LA, SCC and INMETRO agree to formally recognize and promote the equivalency of each other's laboratory accreditations. Since these three bodies already recognize each other under the ILAC (International Laboratory Accreditation Cooperation) Mutual Recognition Agreement (MRA), this first signing is largely symbolic but forms the foundation for expanding recognition in the Americas. Additional IAAC member accreditation bodies in the Americas are preparing for formal IAAC on-site evaluations and expect to be invited to sign the MLA once all requirements are met. Once this happens, A2LA accreditations will become more widely recognized.

A2LA Board of Directors Meeting Highlights

The A2LA Board of Directors (BOD) met October 17-18, 2002 at A2LA Headquarters in Frederick, MD. Meeting highlights include the following items:

- A report on the most common deficiencies cited by assessors during A2LA assessments was presented. The report is posted on A2LA's web site at the following URL: <http://www.a2la2.net/guidance/Common_17025_Defs.pdf>.
- Board members discussed the difficulty testing laboratories are having with the ISO/IEC 17025 requirements for measurement uncertainty and discussed efforts being made by ILAC to develop more discipline-specific guidance.
- Board members approved the addition of another Accreditation Council member, Mr. James Ingram, a calibration expert.
- The A2LA policy on handling relocations of accreditation laboratories was revised.
- The A2LA 2003 budget was approved.

The next meeting of the A2LA BOD will be held on March 10, 2003 in Columbia, MD.
## NEW NCSLI MEMBERS

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2003 Application for Membership in NCSL International

NCSL International is a nonprofit association of laboratories or organizations that maintain or have an interest related to measurement standards and calibration facilities. Each member organization appoints a "Member Delegate" who has the responsibility of representing the member company or organization in NCSL International.

<table>
<thead>
<tr>
<th>Member Company or Organization (Enter name as it is to appear on membership certificate and wall plaque)</th>
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<td>Member Delegate Information:</td>
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<tr>
<td>Member Delegate's Name</td>
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<tr>
<td>Title</td>
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<tr>
<td>Department or Division</td>
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<tr>
<td>Delegate's Business Mailing Address</td>
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<td>City</td>
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<tr>
<td>( ) Telephone Number</td>
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<tr>
<td>E-mail address</td>
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<tr>
<td>Company's URL Address</td>
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</table>

| Appointing Officer* information                                                                        |
| Appointing Officer's Name                                                                             |
| Title                                                                                                  |
| Department or Division                                                                               |
| Mailing Address (if different from Member Delegate)                                                   |
| City | State | Postal Code | Country |
| ( ) Telephone Number | Extension | Fax Number |
| E-mail address                                                                                         |
| Signature of Appointing Officer                                                                       |
| Date                                                                                                   |

- New Member Fee (January-December 2003)...$400
- New Membership plus annual dues renewal
  - New Member $400
  - New Member $400 + 2004 dues $325 = $725
  - New Member $400 + 2004/2005 dues $650 = $1050
  - New Member $400 + 2004/2005/2006 dues $975 = $1375
  - New Member $400 + 2004/2005/2006/2007 dues $1300 = $1700

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Date: __________ Signature: __________

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* The Appointing Officer is the individual from the above company who is appointing the Member Delegate, and is usually the Member Delegate's supervisor. Advanced payment above is guaranteed at $325 per year. No refund for advance payment.
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<info@ncsli.org>  
<www.ncsli.org>

BOARD OF DIRECTORS' MEETING DATES

January 20-22, 2003  
Miramonte Resort  
Indian Wells, CA

April 28-30, 2003  
Boulder Marriott Hotel  
Boulder, CO

August 17, 22-23, 2003  
Tampa Convention Center  
Tampa, FL  
(In conjunction with the NCSL International Workshop & Symposium, August 17-21, 2003)

FUTURE CONFERENCES

2003 NCSL International Workshop & Symposium  
August 17-21, 2003  
Tampa, FL

2004 NCSL International Workshop & Symposium  
July 11-15, 2004  
Salt Lake City, UT

Abstracts are required for Workshops, Panels, and Papers. For more information contact:  
NCSL International Business Office  
1800 30th St., Suite 305B  
Boulder, CO 80301-1026  
Tel: (303) 440-3339  
Fax: (303) 440-3384  
E-mail: <info@ncsli.org>

NEWSLETTER EDITORIAL SCHEDULE FOR 2003-04

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

NCSL INTERNATIONAL PUBLICATIONS CLUB

If your company is already a member of NCSL International, then you may be eligible to subscribe to the NCSL International Publications Club and receive your own copy of the many publications available through NCSL International. Contact the Business Office for details — (303) 440-3339. See inside for application, or go to the NCSL International web site at <www.ncsli.org>