On May 27th of this year, H. Bryan Werner resigned as President of the National Conference of Standards Laboratories. In accordance with the bylaws of our Organization, I have assumed the Presidency, effective immediately. On June 1st, the NCSL Executive Committee, along with other officers, held a special meeting in California where we reluctantly accepted Bryan’s letter of resignation. On behalf of the NCSL, I have sent a letter to Bryan thanking him for the years of support given to NCSL by Westinghouse Corporation and Bryan personally.

1986, as I’m sure you’re all aware of now, marks the 25th Anniversary of the National Conference of Standards Laboratories. This year our annual workshop and symposium will be held at the National Bureau of Standards in Gaithersburg, Maryland, on October 6-9 and will carry the theme of “25 Years of Measurement Progress”.

During the past quarter of a century, there have been a great many innovations and technologies that have advanced the state-of-the-art in the measurement community. This year at our Conference, we are planning many special events to celebrate the 25 years of progress in the measurement community and of course, the National Conference of Standards Laboratories. As a highlight of our workshop and symposium, we will be honoring many of the past presidents, corporations and people who have contributed to the growth and success of our Organization.

Many of us who have been in NCSL for a great number of years can recall the early days at our Organization, where a handful of individuals representing different companies and government agencies sat around a table and discussed the problems of setting up and managing new standards laboratories within their organizations. Those pioneers set the way for some of the finest standards and calibration laboratories in the world today. Not only have we seen a development in state-of-the-art instrumentation and hardware, but that of people. NCSL has prided itself in the training and education of people within the industry. We have succeeded in bringing to the forefront of the measurement community, the need and requirements of our industry to the point where we are today.

Considering how far we have come from such humble beginnings, just think what we can do with the organization we now have in place. The measuring technology will certainly continue its fast pace of progress. The NCSL organization now has the sophistication and committee breadth to tackle almost any problem that faces us. And we seem to have the will and assertiveness to not be satisfied with “no” and “maybe” answers. With all of these assets and resources poised to move ahead, our most important task at the Board level then is to be sure we’re pointed in the right direction. And to make sure the Board continues to keep its direction, we must have the input of all of you.

I hope that you will all join us at the National Bureau of Standards at Gaithersburg in October and be part of “25 Years of Measurement Progress” and the beginning of the next 25 years.

Edward Nemeroff
President
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DON'T FORGET

THE 1986 NCSL WORKSHOP & SYMPOSIUM
"25 YEARS OF MEASUREMENT PROGRESS"
Special Anniversary Program
October 6-9, 1986
to be held at
The National Bureau of Standards
Gaithersburg, MD 20899

CONFERENCE THEME
The theme of the Conference is "25 YEARS OF MEASUREMENT PROGRESS". There have been many exciting and noteworthy developments in measurement science during the past 25 years and accordingly, each speaker and panelist will be asked to share with the conference attendees some of the history of their respective subject matter including the state-of-the-art as it appeared in 1961. Although we do not want to dwell too long on the past, we do want to give timely recognition and respect to the pioneers of measurement science.

EDITOR'S MESSAGE
A real mixture of news this issue
I'm re-running a copy of Issue 62-3 of the NCSL Newsletter, circa 1962. Charlie White, the first editor, sent it to me so our latest members could see how our industry's concerns haven't changed all that much over the years. We certainly have more sophistication in equipment and methods, but organizations and people remain organizations and people.

I also decided to run a reprint of my recent article in Microwave System News with a tongue-in-cheek plea for more recognition in national circles of the inadequacy of the NBS budget. Hope you like it. And maybe even do something drastic, like picking up your pen and writing to James Miller, Director of the Office of Management and Budget.

The reprint on Russian metrology was interesting.

Well-Derived Recognition
Finally, congratulations to Rolf Schumacher of Rockwell for his election as Fellow of ASQC. Rolf is our pre-eminent NCSL Region 8 coordinator.

John Minck, Editor
HIGHLIGHTS OF THE NCSL BOARD MEETING

April 21 through 23, 1986
The Greentree Marriott
Pittsburgh, Pennsylvania

PRESIDENT'S REPORT - Bryan Werner

Bryan reported the appointment of John Lee as Chairman of the Government Affairs Committee. John has been involved in several meetings.

Dean Brungart accepted an action to provide a guideline for setting up of meetings and negotiating with hotels.

Bryan gave the testimony, prepared by the Government Affairs Committee, before the House Subcommittee.

EXECUTIVE VICE PRESIDENT'S REPORT - Ed Nemeroff

Ed reported that he has appointed M. J. Corrigan as the NCSL Liaison to CPEM.

Ed presented his written report to the Board.

PAST PRESIDENT'S REPORT - Pete England

Pete reported that William Wildhack, Jr., is willing to consider and propose to the NCSL a design for the Wildhack award.

Bryan Werner read a letter from Dr. Ambler (NBS) responding to the NCSL input to the National Calibration Service question.

George Uriano reported that it has been agreed that the U.S. will accept measurements made by any laboratory accredited by the British Calibration Service. George reported that Harvey Berger is now in charge of the accreditation program.

Pete discussed the new video tape on NCSL developed by Hutchinson's production crew. He felt that organizational liaison and NCSL committees' roles should be covered more fully.

SECRETARY'S REPORT - Chet Crane

Chet presented the Secretary's written report and membership report. Current membership was reported as 736 members.

TREASURER'S REPORT - Gary Davidson

Gary reported the NCSL financial reports and records are at the CPA's for annual audit.

Gary presented his financial summary sheet for 1985 and for first quarter of 1986 as follows:

(Treasurer's Report - Page 2 - 4/3/86)

1985 Financial Summary

Expenses

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Committees</td>
<td>$31,648.60</td>
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<tr>
<td>Operations</td>
<td>$23,962.84</td>
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<tr>
<td>Subtotal</td>
<td>$55,611.44</td>
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<tr>
<td>Self Sustaining</td>
<td>$(18,332.93)</td>
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<tr>
<td>Subtotal</td>
<td>$37,278.51</td>
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<tr>
<td>Income</td>
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<tr>
<td>Increase/(Decrease) in Funds</td>
<td>$47,339.63</td>
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<tr>
<td>Beginning Cash Assets</td>
<td>$114,438.86</td>
</tr>
<tr>
<td>Current Cash Asset (Year end '85)</td>
<td>$161,778.48</td>
</tr>
</tbody>
</table>

1986 Financial Summary (YTD)

Expenses

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Committees</td>
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<tr>
<td>Operations</td>
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<td>Subtotal</td>
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<td>Self Sustaining</td>
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<td>Subtotal</td>
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<tr>
<td>Beginning Cash Assets</td>
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<tr>
<td>Current Cash Assets</td>
<td>$157,520.89</td>
</tr>
<tr>
<td>Property and Equipment as Cost</td>
<td>$15,461.21</td>
</tr>
</tbody>
</table>

- 3 -
Gary made a motion to establish a Secretary’s budget of $100, an Equipment Management Forum Budget of $500 and to increase the meeting expense account (04-002) from $3,000 to $5,000. Seconded by Ed Nemeroff. The motion carried without opposition.

Bob Lady made a motion to increase the Honors and Awards budget by $500 and that a check be issued to establish a local Honors and Awards accounting Atlanta. Seconded by Bill Simmons. The motion passed, none opposed.

Chet Crane made a motion to accept the Treasurer's first quarter report. Seconded by Ed Nemeroff. The motion passed, none opposed.

Chet Crane made a motion to accept the Treasurer's financial summary for 1985. Seconded by Bob Weber. The motion passed, none opposed.

NBS REPRESENTATIVE’S REPORT - George Uriano

George presented his written report for the NBS Representative.

George presented a written update of the NBS response to NCSL National Measurement Requirements Survey. George agreed to provide Del Caldwell with the information contained in the update. George stated that the update addressed DC and low frequency.

George made available a paper titled "Millimeter Wave Standards: An Emerging Need." This addresses some of the needs listed in the Measurement Requirements Survey.

George reported on the progress of various NBS centers in outputting documentation. There are going to be approximately 80 documents released between now and October. This is the result of a 5-year plan of Dr. Ambler to provide documentation.

George recommends that the Board should get a list of the titles and authors and any requests for copies he will try to fill. It is suggested that the list be published in the Newsletter, it will be available sometime after October.

George discussed the NBS exhibits at shows and from the Atlantic City show be presented cards of people who signed up for metrology or calibration services. The cards were divided into regions and passed out to the directors.

John Martin accepted an action to obtain the tapes provides by George for use by Hutchinson’s people in producing the NCSL tape. These tapes are to be added to the NCSL tape library.

NCSL - NBS EXECUTIVE MEETING - Bryan Werner

Bryan outlined the meeting he and his Government Affairs Committee had with Dr. Ambler and his staff. The most discussed subject was the National Measurement Requirements Survey. The NBS would like for the NCSL to publish an update every 2 years and a complete rewrite every 5 years.

Government Affairs Committee Chairman’s Report - John Lee. John expressed his appreciation to those persons who have helped bring him up to speed.

John stated that the DoD intends to perform a minor rewrite on the MIL-STD-45662. The first draft will be out late in 1986 or early in 1987.

SECRETARIAT’S REPORT - Ken Armstrong

Ken reported that interest in NCSL and NBS is at an all-time high, with more widespread participation.

Secretariat Move - Gary Davidson. Gary reported on all steps needed to prepare for the move from the Bureau. There were several comments regarding the most appropriate time to schedule a change of address.

Secretariat Job Description - Bob Weber. Bob presented his written proposed position description for NCSI Business Manager. The Business Manager shall be selected by the Board of Directors and his services contracted by the Board for the NCSL.

The motion was made to accept the job (position) description as read and presented by Bob Weber as of this date. Moved by George Uriano and seconded by Ed Nemeroff. The motion was approved with no opposition.

NCSL MISSION AND OBJECTIVES - Ed Nemeroff

Ed asked for inputs from the Board Members of things to consider for putting together the Long Range Plan. He plans to have a clearly worded draft by the July Board meeting.
Pete suggested that an important mission is to enhance the image and visibility of NCSL within the member organizations.

NCSL REGIONAL STRUCTURE - Bill Simmons

Bill talked to a number of people regarding the restructuring of the organization. A consensus was that very few people felt any serious problem existed in the present structure. Most often suggested was to change boundaries to reduce the size of some regions. There was some feeling that at the second level there was communication lacking with the Board. A second situation that sometimes causes problems is having directors from outside the region, e.g., instances of a West Coast director having the responsibility for an East Coast region.

Bill Simmons will continue to take suggestions for any change needed. Bill also is interested in receiving input from member delegates who perceive that a problem may exist.

EQUIPMENT MANAGEMENT FORUM - G. Davidson/C. Sides

Charlie Sides presented a series of events which has led to the forum.

Charlie reported that the interim co-chairman for the proposed committee are:

W. E. (Bill) Martin
Lockheed Missiles & Space

G. M. (Gary) Davidson
TRW/OSG

Charlie suggested that the formation of a standing committee for equipment management should be made one of the NCSL goals. Charlie pointed out that equipment management is a broad classification handled differently in various companies and is a parallel organization to metrology in his own company.

25th ANNIVERSARY COMMITTEE REPORT - John Van de Houten

John reported that Don Greb is well along with the Anniversary Newsletter. John also asked that anyone having contributions to the Newsletter should send them to Don Greb. John reported that he has quite a bit of material which he will forward to the Secretariat after he has completed the Anniversary Conference.

1986 CONFERENCE - Moe Corrigan

Moe reported that everything is falling into place. He has not received an answer from his invitation to the White House. Moe presented a list of speakers and a program for the Conference.

BUTLER COLLEGE REPORT - Dr. Fred Woodward and Jim Teza

Dr. Woodward discussed the program at Butler Community College, he reports that placement of graduates has been 100% to date. Fred states that attrition is a little high for this course of studies running about 30%. The program is being shared with other schools but reluctance is encountered due to cost of equipment and difficulty in obtaining instructors.

Jim Teza reported that a BA will be offered at the University of Pittsburgh as a 2-year program to Butler’s graduates. Jim reported that the annual Metrology Fair was being held at Butler College.

OLD BUSINESS

Review of Video Tape - Graham Cameron. The NCSL video tape made at Hutchinson was discussed. Graham commented on the outstanding job that had been done and the pleasant experience of working with the students.

Recommended Practice - Jim Ingram. Jim reported that he has not received very many inputs to change the Laboratory Design Recommended Practice. He has some inputs from France and Australia on laboratory design. He has added several pages of information on Lockheed’s and Martin’s new laboratories. Bob Weber commented that he would like comments from NBS and any other group or individual wanting to comment.

Hillary Taff was assigned as action to determine the status of the Biomedical and Pharmaceutical Recommended Practice.

Guidelines and Bylaws - Dean Brungart. Dean reported that he has turned the roster maintenance to Ken Armstrong.

The Treasurer, the Secretariat, the International Director, and three Vice Presidents have an action item to complete their Guidelines as marked in the latest index to the Guidelines.

Measurement Science Conference - Dean Brungart. Dean presented his written report
which indicates that it was one of the most successful conferences to date. Dean reported that the 1987 MSC will be at the same place (Irvine Marriott) and will be January 29 and 30.

1987 NCSSL Conference - Ed Nemeroff. Ed reported that he and Ken Armstrong have reviewed the facilities and that Ken and Bob Weber will be co-chairs of the Conference. Ken reported that a contract has been signed and a deposit made. The site selected is the Regency Hotel in Denver and is 25 miles from the NBS in Boulder.

It was reported that Dean Brungart will be the first Exhibits Chairman for the Conference. Dean said he thinks he will get about 40 exhibitors and plans on selling an 8-foot table for approximately $500. Dean says that he intends to ask for help from the Board in selling exhibitors on the Conference.

Coalition to Advance Standards - Pete England. Pete presented his letter to Dr. Bruno Weinschel. Pete discussed his letters' contents and several subjects they had discussed. Bruno suggested that Dave Packard would be an excellent spokesperson to carry the measurements community's message. John Lee expressed a desire to pursue a coalition of interested in organizations. Pete discussed his letter to Slade Gorton and presented a copy of the letter as part of his report. Pete felt that the letters presented some good arguments to use against privatizing the NBS function.

OPERATIONS VICE PRESIDENT'S REPORT - Bob Weber

Bob presented his written report to the Board. He reported that Tom Knowles has been formally appointed Chairman of the NCSSL Publications Committee.

Business Systems Committee Chairman's Report - R. Vavken. Roland addressed the current lack of appointing officers on many applications. This was assigned as an activity to directors at an earlier Board meeting.

It was decided that members who do not respond to the questionnaire will be listed under members but not under capabilities. Non-members who respond will be listed. NBS will be listed by each respondent's capability.

Meetings and Programs - Moe Corrigan. Moe presented his written report and a current update of "Meetings and Programs Announcements."

MARKETING VICE PRESIDENT'S REPORT - Bob Lady

Membership Chairman's Report - Bob Lady for Tony Anderson. Bob read Tony's written report and passed around samples of brochures and 25th anniversary stickers. Bob requested that everyone get his requirements for brochures in to Tony.

Ralph Bertermann discussed a problem of invoicing for new members. Some people have a difficult time paying without an invoice.

The Membership Committee is directed to redesign the existing application to have a tear-off invoice.

Honors and Awards Committee Chairman's Report - Jeff Taylor. Jeff reports that he has received all records and materials from Jay Varvell. Jeff requests that anyone needing awards for committees or the Conference should contact him.

LABORATORY MANAGEMENT VICE PRESIDENT'S REPORT - Pete England for Del Caldwell. Pete presented Arno's written report and stated that Arno was asking for information from anyone having knowledge regarding shocking of cells. Gary called attention to the high rate of failure of the NBS transport standard. George Uriano will discuss this with Norm Belecki.

National Measurement Requirements Committee Chairman's Report - Pete England for Klaus Jaeger. Bob Weber reported that Klaus had some concern regarding overlapping efforts by several groups. Klaus is starting to pull together information for a new Measurements Requirements Report.

Laboratory Evaluation Committee Chairman's Report - Pete England for Carl Quinn. Pete discussed a move to establish a separate committee on calibration intervals. The committee would be headed by Dr. Howard Castrup of Science Applications International Corp. Dr. Castrup can be reached at (714) 623-6711 for those interested in work of this committee.

Bryan established a formal Standing Committee to be called "Calibration Interval Committee" to be under the Vice President for Laboratory Management.

Bryan discussed a possible requirement for calibrating magnifying glasses that is being imposed in some places.

Bryan discussed an interpretation of MIL-Q-9858 that may refer to calibration
software. There was discussion of software control requirements.

Dick Drews will put together some information on software quality requirements. He will coordinate the report with Ken Carrington and Harry Haymes.

INDUSTRIAL TECHNOLOGY VICE PRESIDENT'S REPORT - Bryan Werner for Hillary Taff

Bryan reported that Jerry Neidauer has been replaced as Chairman of the Automatic Test and Calibration Systems Committee by Ken Carrington. Bryan suggested that Dick Drews should coordinate his software requirements with Ken.

Utilities Committee Chairman's Report - Ray Di Sandro. Ray reported that he has only recently received the materials from the past chairman. He is scheduling a meeting of the committee during the Conference in Gaithersburg.

There was discussion of new requirements and similarities of MIL-STD-45662 and the NRC regulations. Bryan suggested some utilities member delegates are candidates for committee work.

EDUCATION VICE PRESIDENT'S REPORT - John Martin.

John presented his written report to the Board.

Education and Training Committee Chairperson's Report - John Martin. John commented on the magnitude of the assignment to review the training aid library. It is determined by John that the "Master" tapes will be kept at the Secretariat.

Training Directory Committee Chairman's Report - John Martin for Dave Lorenzen. An action was assigned to all directors to send copies of any training activities announcements to Dave Lorenzen if Metrology-related.

Adjunct Training Committee Chairman's Report - Dick Drews. Dick reported that he held a meeting on adjunct training in Dearborn, Michigan. Dick reported that a new committee member, Mr. Tom Cieslick, will work the computer portion of training as he is expert in that field.

Norm Anderson will contact section/region coordinators for any training information they generate for meetings. He also will contact member companies for any training videos they are willing to loan or donate.

The fuel flowmeter calibration training course is on schedule.

Education Liaison Committee Chairman's Report - John Martin for Kate Webster. John presented Kate's written report to the Board.

Metrology Compendium - John Martin. John reports that Wes Vincent may not be able to continue as chairman. John will contact Wes to determine his plans.

DIRECTOR'S REPORTS - Bryan Werner

International Director's Report - Graham Cameron. Graham referred to a letter regarding technology transfer which had been forwarded to him by Ken. Graham will send a copy of the letter to George Uriano.

Graham Cameron made the motion to increase the budget for the International Region from its current level to $175. The motion was seconded by Chet Crane. Motion was carried, none opposed.

Graham will send a reply to the letter from Japan telling them that the matter is being referred to the NBS.

Bryan discussed what the NCSL could and should do for the Canadian Section since there are currently 40 Canadian members.

Graham will provide Ken Armstrong with a list of people in addition to Andy Dunn that NCSL should send copies of the Newsletter.

Regions 1 & 5 Director's Report - Ralph Bertermann.

- Region 1 - Ralph Bertermann/Harry Haymes. Ralph reported that all delinquent members have been contacted. Ralph presented Harry's formal report to the Board.

- Region 5 Report - Ralph Bertermann/David Duff. Ralph reported that David Duff held a meeting on April 21. He stated that letters had been sent to 120 Indiana companies in an attempt to start a section there. All delinquent members have been contacted in Region 5. Ralph presented David's formal report to the Board.

Regions 4 & 6 Director's Report - Bill Simmons. Bill provided the Board with a written report for the 4th quarter, 1985. This report had been given at the January Board meeting but was not reported in the minutes.
Bill presented his written Director's Quarterly Report for Regions 4 and 6.

Bill reported that Randy Wear, Houston Section Coordinator, has obtained a list of 21 non-members who were invited to a meeting; 12 of these showed up and are potential members.

Bill reported that all unpaid members are being checked out in both regions.

Regions 7 & 8 Director's Report - Jim Ingram. Jim presented his written First Quarter 1986 Report for Regions 7 and 8. Jim stated that the 3/4 inch VHS format was only one needed in Region 7 survey.

Jim reported he has received no comments from Directors on the member's survey of NCSL services.

Jim reported that unpaid members in Region 7 have been contacted and Rolf Schumacher is going to contact those in Region 8.

Region 8 Report - Jim Ingram / Rolf Schumacher. Jim presented Rolf's written report to the Board.

Region 9 Report - David Goodhead. Chet Crane presented David's written First Quarter 1986 Report to the Board.

LIAISON DELEGATE'S REPORTS - Ed Nemeroff

Ed reported that a theme has been selected for the 1987 Conference--"Innovation - Key to the Future"--papers will be tied to this theme.


OIML Liaison Delegate's Report - George Uriano. George reported that there was a meeting in Paris and Dave Edgerly attended. George will report any significant information at the July meeting. George presented his written report for OIML.


CPEM Liaison Delegate's Report - Moe Corrigan. Moe presented his written report to the Board on CPEM. Moe said that there will be poster papers at the Conference where anyone interested can go up and talk to the author of a paper, one on one.

ISA - John Martin for Mike Suraci. John reported that ISA has available for sale written tests for Instrument technicians. They cover several subjects and cost $50 for each test.


IEEE - Ed Nemeroff. Ed indicated that he will contact Jerry Hayes to determine whether he could act as liaison. Ed reported that Bryan has received a letter from the IEEE - Microwave Theory and Techniques Society, formally appointed Dr. Steve Adams to coordinate with NCSL.

CORM Liaison Delegate's Report - Bill Simmons. Bill presented his formal written CORM Liaison Quarterly Report to the Board.

IMEKO Liaison Delegate's Report - Bill Simmons. Bill presented his formal written IMEKO Liaison Quarterly Report to the Board.

ATTENDEES

Bryan Werner Westinghouse
Ed Nemeroff Datron Instruments
Pete England General Dynamics
Pomona
Bob Weber Lockheed Sunnyvale
Bob Lady Lockheed Georgia
John Martin Westinghouse
Jim Ingram Inwil Metrology
W. A. Simmons Barrios Technology
Ralph Bertermann G.D. Searle & Co.
Graham Cameron Canadian Dept. of
Defense
Gary Davidson TRW
Roland Vavken Rockwell International
Chet Crane Teledyne Microelectronics
John Van de Houten TRW
Joe Yaks Ford Motor Company
George Uriano NBS
Dean Brungard Teledyne Systems
Richard E. Drews Martin Marietta Measurement Systems
Ken Armstrong NBS
J. C. Taylor Lockheed Georgia
R. DiSandro Philadelphia Electric Company
M. J. Corrigan, Jr. Lockheed Electronics Company
John Lee Boeing
April in Pittsburgh, snowdrifts are melting, trees and meadows greening. And the NCSL Board of Directors comes out of hibernation. Good planning gang—January Board in San Diego, April in Pittsburgh. I’m waiting to see if Ed Nemeroff will call a winter meeting for Hawaii!

Fred Woodward, President of Butler College (2nd from left), discusses their metrology program with the Board. Also attending was Jim Tusa (3rd from left), founder of the program.

Bryan Werner (l) and Ernest Garner (3rd) addressed high school seniors visiting the Butler College Measurement Science Fair. They explained the field of Metrology and talked about career opportunities.

At the Board dinner, Bill Simmons, Moe Corrigan and Dick Drews are in animated conversation with the hand of someone, who is obviously the expressive type.

Two past presidents “enjoying” the Pittsburgh climate (Brown).
EDITOR'S NOTE: To continue to recognize some of our NCSL founding fathers, I thought I'd include several early copies of the NCSL Newsletter (called "NCSL Publicity Release" at that time).

IT WAS A GOOD CONFERENCE!

NCSL PUBLICITY RELEASE
No. 62-3 October 1, 1962

The by-line above is the impression we gathered after the turmoil was over on Friday, August 10. As one who actively participated in the several associated meetings, I'm sorry to say that I didn't see as much of the Conference or its attendees as I wished. However, feedback from many information sources completed my news loops and it all indicated one thing - NCSL had a successful show. Without question, the driving force of Lloyd Wilson, the persistence of Charlie Johnson, the sweat and blood from Jim Brockman, Harvey Lance's determination, Dr. Allen Astin's personality, Bill Wildhack's quiet but effective gathering of support, each Section Chairman's anxiety, plus the efforts of dozens more, paid off!

Those who attended the Conference went home with plenty of the usual loot - preprints of papers. And like me, they probably are still reading! For those who were unable to attend, an opportunity will be afforded you to obtain the Conference Proceedings when they are released toward the end of the year. Attendees will receive a copy automatically and at no cost as part of their registration fee.

Speaking for the General Committee, it was gratifying to see the NBS auditorium almost half-full for the Delegates Assembly, a meeting open to all interested Conference attendees. The standing expression of gratitude for retiring Chairman Lloyd Wilson's tremendous job during the past year was a small token of the appreciation of all Measurements Standards people for the work output of a most determined individual. Without question, he established a precedent for all future Chairman to observe and acknowledge.
We were welcomed by the newspapers.

Dr. Allen V. Astin

Boulder Lab To Host Meets On Standards

More than 1000 industrialists, scientists and government officials will attend two scientific conferences at the National Bureau of Standards (NBS) in Boulder this month. The Standards Laboratory Conference, Aug. 8-10, will be followed by the International Conference on Precision Electromagnetic Measurements Aug. 14-17.

Dr. John Holloman, new assistant secretary of commerce for science and technology, will address both meetings.

Dr. Allen V. Astin, NBS director, will give the opening address at the Standards Laboratory Conference Wednesday.

The conference is being sponsored by the National Conference of Standards Laboratories. NBS Dep. Director Dr. Robert D. Huntoon will address the opening session of the second conference, to be sponsored by NBS, the Institute of Radio Engineers' Professional Group on Instrumentation and the American Institute of Electrical Engineers Instrumentation Division.

The second conference will be supported in part by funds from the National Science Foundation.

A total of 81 scientific papers will be presented during the two conferences.
The result of the balloting for office and for membership on the General Committee was as follows:

<table>
<thead>
<tr>
<th>Name</th>
<th>Company/Location</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charles E. Johnson</td>
<td>Boeing Aircraft, Seattle</td>
<td>Chairman</td>
</tr>
<tr>
<td>Harvey W. Lance</td>
<td>NBS-Boulder</td>
<td>Vice Chmn</td>
</tr>
<tr>
<td>Ivan G. Easton*</td>
<td>General Radio</td>
<td>Corresp'g Sec.</td>
</tr>
<tr>
<td>Herbert D. Barnhart</td>
<td>General Electric, Syracuse</td>
<td>General Comm.</td>
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<tr>
<td>Jerry A. Joeschke</td>
<td>NAA-Autonetics, Downey</td>
<td>General Comm.</td>
</tr>
</tbody>
</table>

Continuing in office for one more year of a two year term is C. E. White as Recording Secretary/Treasurer.

Chairman Wilson read excerpts from the first Annual Report, copies of which were distributed to attendees. In it he traced the formation of NCSL from the general meeting held at Boulder on June 23, 1960 under the auspices of Harvey Lance and the chairmanship of Ivan Easton, through the formation and functioning of the Ad Hoc Committee under Curt Biggs, and finally the Los Angeles meeting on September 15 which saw the new organization formed. He outlined the formation and functioning of the Special Committees which formed the backbone of the Standards Conference held during the year. At the conclusion Chairman Wilson touched upon several recommendations for the future course of NCSL which are briefly stated as 1) the need for assuring continuity in the future operations of NCSL, 2) the requirement to recruit more people to assist in the work of NCSL, 3) the urgency of facing up to and finding solutions to our problems, 4) the necessity to focus the attention of NCSL upon problems of standards activities, and finally 5) to determine ways and means to help laboratories to help themselves.

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As an outgrowth of comments to the General Committee made by T. A. Marshall Jr., Executive Secretary of the American Society for Testing and Materials, there is a movement under way to provide in the Directory of Testing Laboratories - Commercial-Industrial, a listing of laboratories engaged in measurement standards activities. ASTM is in the process of issuing a revision of their directory. Because of the importance attributed to listings, the closing date for inclusion in the listing has been extended to approximately October 15, 1962.

*Two year term of office
In an effort to be of service to all readers interested in this listing, we have taken the liberty of reproducing the general letter sent out by ASTM, together with a reproduction of the classification lists which are descriptive of the operation of the laboratories. Should you desire to be considered for the listing, you are strongly urged to have the Administrative head of your standards activity fill out the data forms attached and return to Fred F. VanAtta of ASTM in Philadelphia.

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Since it was requested at the General Committee Meeting that the Publicity Releases be continued for the immediate future, an effort must be made to streamline the handling of the mailing. Accordingly, all readers who receive a copy of this Release will please note the requirement to fill out and return the brief "request form" which is part of this issue. Future Releases will be sent only to those individuals who have furnished us with guaranteed addresses, thereby cutting down on our overhead.

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The Bureau of Standards announced two years ago that it was adopting a new series of prefixes for units in accordance with suggestions by the International Committee on Weights and Measures. Since that time, some use has been given the new prefixes but there seems to be some confusion yet, both in application and in pronunciation. Accordingly, we are taking the liberty of repeating the list as presented by the Bureau.

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Multiple/Submultiple</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>tera°</td>
<td>$10^{12}$</td>
<td>T</td>
</tr>
<tr>
<td>giga°</td>
<td>$10^{9}$</td>
<td>G</td>
</tr>
<tr>
<td>mega</td>
<td>$10^{6}$</td>
<td>M</td>
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<td>kilo</td>
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<td>k</td>
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<td>hecto</td>
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<td>h</td>
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<tr>
<td>deka</td>
<td>10</td>
<td>dκ</td>
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<td>deci</td>
<td>$10^{1}$</td>
<td>d</td>
</tr>
<tr>
<td>centi</td>
<td>$10^{2}$</td>
<td>c</td>
</tr>
<tr>
<td>milli</td>
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<td>m</td>
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<td>micro</td>
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<tr>
<td>nano°</td>
<td>$10^{9}$</td>
<td>n</td>
</tr>
<tr>
<td>pico°</td>
<td>$10^{12}$</td>
<td>p</td>
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</tbody>
</table>

°Tera is pronounced like "terra" in "terra firma."
Giga has the initial g pronounced as a j, i is pronounced as "eye" and the final ga is like the ga in gal. Nano is pronounced "nane-o." Pico is pronounced "pike-o."

- 13 -
One of the problems which NCSL recognizes and will meet with action, is that of personnel training. This subject not only applies to initial training but is a necessity to keep measurement people abreast of the times by indoctrination into new techniques and introduction to new devices. In Massachusetts recently, two seminars were held which contributed in part to solving the problem. At a meeting held in Natick Dr. G. Sorger, currently lecturing at Georgetown University, and representing Weinschel Engineering, held the interest of an audience for one day while exposing them to the intricacies of attenuation measurements, particularly at the high frequencies.

Simultaneously, a four-day seminar was being conducted in Burlington for local measurements people interested in several phases of high frequency measurements. Mr. E. Matlock, representing Hewlett-Packard, travelled from the West Coast to spend four arduous but productive days lecturing on all aspects of the measurement problems encountered by calibration activities.
Admittedly New England is not unique in this type of activity, and also a slight commercial bias is apparent in the presentations but - here is one excellent source of talent upon which to draw on a regional basis, and a source which ought to be encouraged more, with only one proviso - more coordination in planning meetings in order to give a greater good to more people.

Does your activity overlook an important function which it should perform for your company? Have you evidence that instrumentation is abused through plain, ordinary ignorance of operating procedures? Then do something about it! Let it be known throughout your plant that your people are qualified to explain the operation of test instrumentation to anyone who requires this service.

Sure this micrometer fits - give it a little 'twist!'

"We'll make a couple of, uh, adjustments to check this difference of measurement!"

Present it in such a way that no one resents your help and you will have another gold star pasted on your organization chart by the boss. (And the Quality Control inspector will lead a more normal life.)

That's all for now - we're out of information. Don't forget to register for future issues, and send along some news items to C. E. White, AVCO R.A.D., Wilmington, Mass.
COMMITTEE NEWS

PROPOSED CHANGES TO THE DC VOLTAGE AND RESISTANCE

A Response by the National Measurement Requirement Committee (NMRC)

Summary prepared by:

K. Jaeger, NMRC Chairperson
April, 1986

I. INTRODUCTION

At the end of 1985, a summary report regarding the proposed DC voltage change was submitted from the NCSL to Dr. E. Ambler, director of the National Bureau of Standards. The following constitutes an abbreviated text of the report. In essence the report summarized responses gathered by the National Measurement Requirement Committee (NMRC) during 1985. It presents some background information and then states several points raised by members of the NCSL.

II. BACKGROUND

The Comite Consultatif d'Electricite (CCE) is one of eight standing consulting committees of the Comite International des Poids et Mesures (CIPM). It has been asked to decide on new values for the ratio of constants 2e/h and h/e^2 where e is the electron charge and h is Planck's constant. The next meeting of the CCE has been scheduled for the latter part of 1986 (1).

This has also been officially announced by Dr. B. Taylor of the NBS at the latest NCSL conference in Boulder, Colorado(2). The recommendations by the CCE will be presented to the CIPM which in turn will, after approval, present the recommendations to the Conference Generales des Poids et Mesures (CGPM) for an official and final vote. If the recommendations for new values of the constants are voted in, then they become the official values for the Bureau International des Poids et Mesures (BIPM).

At issue are the ratios 2e/h and h/e^2 which are inversely proportional to the DC voltage and directly proportional to resistance, respectively. The first ratio is due to the AC Josephson effect presently being employed throughout most industrialized countries as the absolute standard for defining the DC voltage. In fact, the relationship is:

\[ \frac{2e}{h} = \frac{48359x.xxx}{V} \]

where the x's indicate differences in values employed worldwide. There are presently four different values being used throughout the world:

1) U.S. NBS: 483593.429 GHz/V
   (Initiated by the NBS on July 1, 1972.)

2) Most other Western nations including BIPM: 483594.000 GHz/V
   (Initiated in October 1972. This value was recommended by the CCE based on the values of physical constants as known experimentally at that time, i.e., to conform with SI units, defined below.)

3) France: 483594.64 GHz/V
   (This value was chosen so as to avoid a discontinuity between the mean of a set of standard cells and the AC Josephson Junction value (2).)

4) Soviet Union: 483596.176 GHz/V
   (Initiated in the late 1970s. The value was chosen so as to conform to SI units as closely as possible.)

These values indicate that the difference between 1) and 2) is only 1.20 ppm, i.e., difference between U.S. and most other western nations is very small. Hence only an adjustment of 1.20 ppm is needed to bring most industrial western nations to a common ratio.

The second ratio is a direct result of the recently discovered quantized Hall effect (QHE)

\[ \frac{h}{e^2} = R_h \]

which states that the Hall resistance can be defined as the ratio h/e^2. Most national standards laboratories are considering the QHE as a means of defining the absolute ohm, unit of resistance. Hence an agreement in this ratio is also needed. Internationally, the unit of resistance is presently being maintained via Thomas type wire wound resistors, or equivalent units.

For the last 15 years, new experimental observations of certain physical constants have forced the international community into a reevaluation of the presently accepted values. Reports of such experiments are listed in reference (3,4). Most of these constants can be expressed in terms of International System of units
A special task group on fundamental constants, organized by the Committee on Data for Science and Technology (CODATA), has over the last few years, studied the available data for physical constants. New values are scrutinized in detail before being accepted as legitimate measurement values. Periodically, a least squares adjustment of many constants is carried out and recommendations regarding specific constants values are forwarded to the general assembly of CODATA.

It is much too involved to discuss all the different relationships here. (The interested reader should study B. Taylor's articles on the subject.) However, there still remain several alarming disagreements of some constant values as reported by different experiments. In particular the determination of constants such as $d_{220}(Si)$, the 220 lattice plane spacing repeat distance differ by up to seven standard deviations; the $p_{low}$ (gyromagnetic ratio of protons in water at low magnetic fields) values differ by up to twelve standard deviations. Clearly, more experimental data is required and, hopefully it will come from sources other than those already published.

The proposal by the NBS is not only to come to an international agreement for the $h/e$ ratio but also to adjust the ratio according to SI units. The former was possible in 1972 but was not initiated for reasons not understood by most of the industrial community. (The difference of 1.20 ppm between the U.S. NBS and most of western nations (including BIPM) is actually a minor one.)

Adjustment to SI units will involve a major increase of 9.29 ppm for the NBS and 8.0 ppm for most of the rest of western nations. The magnitude of this adjustment is almost identical, but in opposite direction, of that initiated in 1969 by the international community also for the purpose of conforming to SI units. (The corresponding adjustment for France will be 6.76 ppm and for the Soviet Union will be 3.58 ppm.)

In case of the U.S. legal ohm, an increase of 1.5 ppm is anticipated. This is a minor adjustment and not considered to be of great importance by most institutions.

III. RESULTS OF SURVEY

The responses of this report are not listed here, but have been forwarded to the NBS. Suggestions, comments, etc. were tabulated and then categorized without addressing specific issues. In addition, the author of this report has had many informal verbal communications with members of industrial laboratories. Consequently, some comments made below might not be evidenced by the provided responses but are instead a reflection of the author's overall perception and sometimes of his own bias.

1) Resistance

Since the proposed change of the resistance amounts only to an increase of 1.5 ppm, it was generally agreed that such an adjustment would be minor. Most likely only high quality standards laboratories would be effected and even for those, such a small discontinuity would not be of great concern.

2) Voltage

The main theme apparent by many inputs is: "SLOW DOWN". Several observations have to be made here:

a. Constants

Are all the constants used in the least squares adjustments well enough understood to warrant inclusion in the process (e.g., $d_{220}(Si)$, $2p_{low}$, etc.)? Have all experimental biases been evaluated, understood, etc.? Are the experimental disagreements (especially between different countries) understood? Are new experiments being undertaken by the original groups or by new ones? If not by new ones, who is to say who is right?

All constants required for the adjustments of e and h to SI units should be well in hand. There is a great concern that the proposed adjustment of the constants is in opposite direction to the one performed in 1969. Is the international community sure that this is now in the correct direction or will it oscillate again in 10 or 20 years?

Finally, is this the right time to consider a major adjustment? Is it possible that in 2 or 5 years better experimental results will be available? Is there a better chance to come to international agreements on some constants later on in this decade or never at all?
b) International Agreement

Most inputs favor some form of international agreement. In some cases, the present form of known off-sets was considered adequate. However, for manufacturers of electronic high accuracy equipment, international agreement is extremely important. Such agreement would eliminate different adjustments and calibrations of equipment required for different countries. Hence, eliminating the 1.20 ppm difference between the NBS and most other western countries would help manufacturers tremendously. This difference is considered minor and would effect only high accuracy standards laboratories.

Agreement with SI units was not considered important by most industries as long as all (or most countries) used the same ratios, it would not matter how close or how far the values are from accepted SI values. On the other hand, it is also clear that for an international agreement, one needs some kind of set of base constants (units). And what better set would be available besides the SI set?

c. Evaluation of Process

It has been recommended very strongly that:

1) a domestic panel of experts be established that do not only include members of NBS but also personnel from industry and academia.

2) an international panel of experts be established that include experts not only from national standards laboratories but also from industries and academic institutions.

It appears that in both cases, most of the industrial community is not aware of the BIPM process with committees, etc. How does CODATA tie into CCE for instance? Clarification by the NBS with regards to the committee chain should be helpful.

The involvement of industrial and academic members needs to be answered. It appears that many members feel that NBS' decisions are arbitrary without due cause of evaluations in terms of impact in trade, cost, manpower, etc. (Perhaps it would be worthwhile for the NBS to set an extra day aside during the upcoming CPEM conference in June of 1986. Interested parties could then present special items of concern, etc. to members of NBS and even CCE.)

d. Magnitude and Effect

The magnitude of 9.3 ppm is considered significant for all high accuracy laboratories. As mentioned under b) a 1.20 ppm adjustment for an international agreement of most nations would be considered trivial. The large step of almost 10 ppm will required careful planning by many laboratories which employ high accuracy DC calibrators as well as 7-1/2 and 8-1/2 digital multimeters. The effect of the adjustment will be noticeable by users who rely on such instruments and who cannot recalibrate all of their equipment at the same time.

Several responses indicated costs of $20 k, $50 k, 6 man-months or more. Clearly, it is very difficult to assess the impact but a very careful plan by each industry and then by each laboratory is required. Concern has been raised as to how industry can conform to MIL-STD-45662 during the transition period. How will the auditors respond? Who will educate the auditors?

e. Secondary Effects

Besides the DC volt, other standards will be effected. Of these DC current, DC resistance, AC current, AC voltage, thermometry come to mind. Careful evaluations of such standards has to be undertaken by high accuracy laboratories. Instruments used for monitoring such standards have to be adjusted with the primary voltage otherwise interchangeability of high precision units will not be possible.

The entire issue of secondary effects has to be given some careful consideration. Guidelines by the NBS would be welcome by most metrologists.

f. Documentation

Concern has been aired as to the appropriate timing of the adjustment. Should it be in 1986, 1987, or later? What is the best time for industry? It has been suggested that the NBS prepare the user community with special bulletins beforehand. Next, a specific letter should be issued stating the exact numbers, conditions, dates, etc. The user then has to alert its own organizations as to the impending change. Hence adequate time should be allowed by NBS to prepare the country.

Other concerns raised are with changes of laboratory procedures, other documentation, etc. These are items of extreme importance for industries involved with military contracts which insist on fully documented and updated procedures for all units requiring calibrations. The manpower needs in this area alone are impossible to assess at this time but will be enormous.
g. Legal Ramifications

A very significant concern was aired in regard to legal responsibilities. Items under warranty and out in the field might suddenly be out-of-tolerance. Who is responsible? Who pays for recalibration? Who determines priorities? Once again, the industries working on military contracts will have to solve some tough questions.

Similarly, commercial calibration laboratories are concerned with instruments that left their calibration laboratories prior to the adjustment. Who is responsible for those calibration now being out-of-tolerance? It is not clear that an answer can be found but the issue should be addressed.

IV SUMMARY

The proposed increase of \( \times 10 \) ppm of the U.S. legal unit of voltage has raised some very serious doubts and concerns. It appears that this change is being proposed just 16 years after the last adjustment (in the wrong direction). It is urged that the NBS and, for that matter, the international community makes absolutely sure that the correction this time is of the correct magnitude and is in the right direction. It does not make sense to adjust now and 10 or 15 years from now again.

It is almost a consensus that an international agreement of the \( e/h \) ratio be established. At present this would require a minor adjustment if SI conformity is ignored. Most responses are not concerned with SI agreements and yet do not propose an alternate scheme of constants or units to be used.

Careful attention should be given to legal and contractual ramifications. The NBS should not only clarify these issues within the Commerce Department but also with the Department of Energy, the Department of Defense, and the military branches thereof.

Finally, there is always one in the crowd who suggests: "Leave it as is."

REFERENCES

1) Announcement

Metrologia 21, 225, (1985)

2) Possible Changes in the U.S. Legal Units of Voltage and Resistance

B. N. Taylor
NCSL Newsletter 25, No. 3
September, 1985

3) Precision Measurement and Fundamental Constants II

NBS Special Publication 617
August, 1985

4) IEEE Transactions on Instrumentation and Measurements

Volume IM-34, No. 2
June, 1985

5) Electrical Units, Fundamental Constants, and the 1983 Least Squares Adjustment

B. N. Taylor
Article in reference 4.
UPDATE OF NBS RESPONSE
NCSL NATIONAL MEASUREMENT REQUIREMENTS SURVEY

May 10, 1986

DC/LF ELECTRICAL MEASUREMENTS

By

GEORGE A. URIANO
NBS REPRESENTATIVE

GENERAL COMMENTS

NBS priorities and plans basically remain the same as stated in the 1984 NBS response to the NCSL requirements study. There have been several new developments that are noted here. Turnaround times have been reduced significantly for most of the previous problem areas. There are queues of as long as 9 months in several areas (e.g. thermal converters). However, in such cases, calibrations are being scheduled months ahead of time and being completed usually within one month of when devices are received by NBS.

A number of improvements in existing services and several new special test services related to NCSL-identified requirements are described below.

DC VOLTAGE Contact: Norman Belecki (301) 921-2715

1. 10 V MAP; 0.1 - 0.3 ppm uncertainty

Preliminary testing of a new MAP in this area using Zener diodes has been started. If feasibility is established, a new service could be announced in about a year. Existing measurement system is being cloned to handle more Zeners. Whether MAP will achieve an uncertainty of 0.1 ppm remains to be seen. An uncertainty of 0.3 ppm should be achievable.

2. 0.01 - 1000 V MAP or calibration service; 1 - 10 ppm uncertainty

No changes in this area. Plans are being made to address problem in 1987.

3. 1 V MAP; 0.1 - 0.2 ppm uncertainty; reduction in turnaround time

The attempt to use unsaturated cells as new transport standards did not work satisfactorily. Bruce Fields and Thomas Kiess are now working on an alternative approach: using Zener diodes and resistive dividers. Turnaround time has been reduced to five weeks and is holding. This is the minimum time required for a good transfer.

AC/LF Voltage Contact: Norman Belecki (301) 921-2715

1. 0.1 - 100 V; 20 Hz - 20 kHz; ± 5 ppm & 0.1 - 100 V; 20 - 100 kHz; ± 10 ppm

Not sure of long term stability and requirements for recalibration.

2. 0.1 - 100 V; 100 kHz - 1 MHz; ± 100 ppm

Preliminary work is underway to improve accuracy to a target of 150 ppm at higher frequencies. Standards are being evaluated up to 1 MHz.

3. 0.1 - 100 V; 1 - 50 MHz; ± 200 ppm

Contact: Greg Rebuldeia (303) 497-3561

No change, only a few customers seem to need calibrations in this frequency range. An uncertainty of ± 200 ppm is extremely demanding and would be expensive to implement. Our assessment is that an uncertainty of ± 500 ppm would be more commensurate with the needs of customers. NBS needs additional justification before any work would be initiated to meet this requirement.

4. Automation of test equipment for the above (Electricity Division)

Completed up to 100 kHz.

5. AC voltage transfer standard

Solid state thermoelements are being evaluated. It looks like their performance will be somewhere between existing secondary and primary standards.

6. AC voltage MAP

Alternatives such as use of voltmeters or sources must be evaluated. Some preliminary measurements have been made on sources. Active pursuit of additional work must be delayed because of other priorities.

7. Development of two automated voltage measurement systems: (1 - 1000 V up
to 100 kHz at ±10 ppm; calibration of dc/ac voltmeters up to 1 MHz at ±5/±50 ppm) Contact: Barry Bell (301) 921-2727

The first system, which operates up to 100 kHz, is nearly complete. Software is still being developed. Plans are to extend the operating frequency to the 1-10 MHz range. Work on the second system has stopped because of a loss of CCG funding. This would be a portable system intended for "field" use. The Navy may be interested in reestablishing the project. In any case, it would be difficult to meet the ±50 ppm requirement at 1 MHz. NBS will not finish the portable system without other agency financing.

DC AND AC RESISTANCE MEASUREMENTS
Contact: Norman Belecki (301) 921-2715

1. AC resistance: 0.1 - 100 kilohms; 60 Hz - 10 MHz

No change. Project probably won't begin for two years.

2. Multimegohm resistors up to 10 terohms at 250 V

Work on project has been delayed because of higher priority need to finish O.C. documentation by October of 1986. Still aiming to complete project by end of 1987.

3. High current resistors up to 2 kA at ± 0.02% accuracy

Some equipment available to perform measurements up to 3 kA at greater uncertainties. Because service is available from Canada and is not in great demand, the development of a higher accuracy service has been given lower priority.

4. Calibration of ratio devices; seminars on ratio measurements

No change.

CAPACITANCE MEASUREMENTS
Contact: Norman Belecki (301) 921-2715
Robert Hebner (301) 921-3121

1. 2-, 3-, and 4-pair terminal capacitors; 1 - 1000 pF; 100 Hz - 10 MHz

No change.

2. Capacitor dissipation factors; Capacitance and dissipation factor of gas-dielectric and sold-dielectric capacitors at power frequencies and high voltage.

Automated capacitance bridges now being built in the Electricity Division are capable of measurement of dissipation factors. Calculable capacitor will be linked to bridges to give phase angles. It will take approximately 1.5 years to finish and test bridges. Two years additional will be needed to develop service. Will be able to measure any 3-terminal capacitors.

Services have been available from the Electrosystems Division for measurement of capacitance and dissipation factor of capacitors at power frequencies. Measurements at 60 Hz are now performed as routine calibrations. Other frequencies between 50 Hz and 400 Hz are performed as special tests.

3. Capacitance MAP; 10 pF - 1 mF; 1 kHz - 1 MHz

No change.

4. Capacitor calibrations to 1 µF; 120 - 1 kHz

No change.

MAGNETIC MEASUREMENTS
Contact: Fred Fickett (303) 497-3785
Robert Hebner (301) 921-3121

1. DC magnetic field strength, to 10 K Gauss, 0.5% accuracy; AC magnetic field strength, LF to 175 kHz, 3% accuracy

For electric and magnetic field strengths from DC up to several kHz, NBS has developed documented procedures, which allow customers to be self-calibrating. No direct calibration services are being routinely provided at this time and there are no plans to initiate any. CEEE has initiated a program to develop methods for measurement of magnetic properties (e.g. coercivity, local field) of computer storage media (e.g. tapes and disks).
CURRENT MEASUREMENTS
Contact: Robert Hebner (301) 921-3121

1. Extend calibration range of current shunts to 2000 A; Develop improved standards for higher (up to 50 kA) currents

An R&D program has been started to develop a special test service for pulsed 60 Hz currents up to 100 kA. We expect a very limited demand (6-8 laboratories) for this service.

POWER AND ENERGY MEASUREMENTS
Contact: Robert Hebner (301) 921-3121

1. Improve accuracy of routine watthour meter calibration service from ±0.05% to ±0.02%

A five year program is underway to upgrade the complete service by the end of 1988. NBS now can provide the required accuracies as special tests. These are expensive. A routine calibration service at this accuracy level should be introduced by the end of 1988.

2. Improve current watthour meter MAP uncertainty of ±0.05%

An uncertainty of ±0.05% is not an NBS limitation, but rather a limitation of the customer. Most MAP's indicate customers can achieve ±0.03%. NBS can currently support even smaller uncertainties.

PHASE ANGLE MEASUREMENTS
Contact: Barry Bell (301) 921-2727

1. Extend frequency of present special test service from 5 kHz to 50 kHz; improve to ±0.001 degree

NBS capabilities have been improved to ±0.005 degrees in the range of 2 Hz to 5 kHz and ±0.030 degrees in the range of 5 kHz to 50 kHz. A new Technical Note 1220, "NBS 50 kHz Phase Angle Standard" by R. S. Turgel has been published. An additional Technical Note is currently going through final review, which describes a routine calibration service for phase angle meters. NBS also plans to offer a special service for characterizing new types of precision phase angle standards.

NEW OR IMPROVED SERVICES NOT IDENTIFIED IN THE NCCL REQUIREMENTS STUDY

1. AC Voltmeters, 0.1 Hz - 10 Hz, 0.5 mV - 7 V rms

This new calibration service is described in NBS Technical Note 1182.
EDITORS NOTE: Discussions proceed on possible reorganization of NCSL Regions and Sections. By any measure, most would agree that Roll Schumacher's Region 8 has been highly successful. Here are some of his ideas on Regions and members.

Following Roll are some related comments by President Bryan Werner.

April 8, 1986

TO: NCSL BOARD OF DIRECTORS

Subject: Comments on Possible Reorganization of NCSL Regions.

This is to share with you my thoughts and observations regarding the subject matter and submit my ideas and proposals for your consideration.

If we consider the total NCSL membership as the basis of the NCSL organizational pyramid, then the Regions are the main influence in cultivating that basis. The Regions with their regional meeting provide most of the benefits rated most highly by the membership of NCSL as reported in the April 1986 NCSL Newsletter. Good membership participation and interaction on the regional level may be credited with being one of the major factors generating more membership, strengthening the organization, and bringing good future leaders to the surface. Any reorganization of the regional structure should, therefore, have as one of its major aims a strengthening of that structure. At the very least, it must not be weakened.

NCSL Regions at Present

So far, the regional structure has not been very strong. Typically, the NCSL President appointed the regional coordinators—from my experience—probably mainly on the basis of availability. The NCSL President has rather limited visibility of the potential talent available in the regions. Some, not all, directors have, at the beginning of their one-year terms, marginally better visibility if their directorate includes their home region. But their interest and concern in directing their regions, for a term of one year at a time or typically two regional meetings, is one of personal preference, given their various other responsibilities. Some directors who were re-elected and re-appointed to the same directorate could and did exert a beneficial influence on the management of the regions when they were so inclined, but this has been a matter of chance, not of design, and constitutes one of the weaknesses I perceive in region management.

The degree of influence that the directors normally have in the selection of Regional Coordinators is likely to vary considerably with the leadership style and degree of interest of the President and the directors. It, too, is a matter of chance in the existing organizational structure.

Hence, regions have mostly, as seen from my vantage point, been operated by the NCSL leadership in accordance with broad and liberal laissez-faire principles. So, as a resulting matter of chance, the regions themselves operated with vastly differing styles, goals, principles, and degrees of success, if success can be measured without an explicit standard.

I know of some regions which, in the past had very little or no activity, sometimes until the Regional Coordinator dropped out altogether. The NCSL Coordinator who was replaced for under-performance. By the time the NCSL President or the responsible director recognized problems, their terms were about over. Setting of goals and performance standards remains the responsibility of each individual without direction from the Board.

These are, in my opinion, the weak points in the existing regional structure. One step toward strengthening at least the regional performances, as I see it, was the release of NCSL Guideline §70.4, setting some performance standards. But control of compliance remains as a weak point.

Regional Leadership from the Top or from Grass-Roots?

It can be argued that all of NCSL, beginning with the regions or section, should be run democratically, including regions or sections setting their own goals and standards. To do this effectively, however, the structure of NCSL must be changed to encourage the formation of grass-roots opinions, will, and initiatives and to permit the execution of the will so formed.

At this time, NCSL is directed from the top with advice and consent on the major issues mostly by voice vote from the membership, very much like all other professional organizations. If it is intended to maintain this modus operandi, I recommend that the leadership from the top extend to the base regardless of how NCSL is restructured. Specifically, election of coordinators or Regional Directors, or both by the sectional or regional membership would sever the leadership role of the NCSL President and Board above the basis with nothing to take its place. So, before deciding the question whether the regions should be lead form the top or from the grass-roots, another question should first be answered.
Regional Organization

WHO HAS FINAL AUTHORITY OVER THE REGIONS OR SECTIONS?

Final Authority has the one who can dismiss the Regional Director or Coordinator. To confer that authority to the sections or regions, NCSL must first create a mechanism for consensus building within the sections, perhaps by running election campaigns for Coordinator or director with different candidates offering different objectives. But what will be done to prevent some people to be elected by default and sections being taken over by "special interest"? In a democracy, this may be only a temporary problem if it arises and eventually self-correcting, because people cannot and will not usually "opt out". For NCSL, it may be fatal. NCSL members can—and will—"opt out" if they don't like the way their organization is operated. Thus, the Sections would need a mechanism to recall unsatisfactory directors or Coordinators. If the section membership does not take sufficient interest in the section operations and management, chances are, members will drop out. Would the Board stand idly by while sections deteriorate and finally vanish? Or will the Board confirm its Final Authority and step in, thus voiding the membership's election?

To operate NCSL from the grass-roots, requires more, mainly some mechanism that assures unity of purpose. If Sections are operated by grass-roots consensus, more likely than not, different sections will have different goals and objectives. How then will the goals and objectives of the NCSL as a whole be formed?

NCSL in Evolution

I do not believe NCSL intends to start such a fundamental change in its operation as the separate election of Section or Regional Coordinators or Region directors would logically require.

To improve present regional management without major restructuring of NCSL, the Regions should be rezoned from time to time as they have been in the past to accommodate shifts in membership and to adjust to changing operating conditions. Regional or Section Coordinators need a direct line of communications to the Board which could be provided by the Regional Director. Therefore, the Regional Director should be a member of the Board or have continuous access to a Vice President responsible for regional management. Such a vice presidency also appears necessary in the interest of providing more effective regional management by the President.

The Directors

Given the importance of the professional leadership of the regions, the directors must be enabled to concentrate effort and attention to the management, guidance, and supervision of the sections. For a volunteer organization as NCSL, the number of sections to be directed by any one director should be limited to five or six. Responsibilities for tasks other than managing regions should be delegated to other directors with no regional management responsibilities.

To provide continuity of direction, directors appointed to direct regions should normally serve in that capacity for not less than three years. It would take at least a year for a Regional Director to become familiar with the performance of the Section Coordinators, and no changes nor improvements can be expected from a Regional Director before such a period.

To assure effective leadership of the regions by the President, the President should appoint elected directors to head regions upon the recommendation of the Vice-President, Regional Management. The Vice-President, Regional Management, determines the candidates for the office of Regional Director from the pool of the elected directors and may, at his discretion recommend re-appointment of directors during their term. Hence, the number of NCSL directors should be larger by three than the number of Regions. To permit the Vice-President, Regional Management, to appoint freely directors to head those assignments to which they are best suited, he should be empowered to change assignments of all directors.

Each Region should nominate and elect a director who will be given first consideration to serve as Regional Director. In addition, three directors should be elected NCSL-wide from a slate to be nominated by the Board.

As a result of the above considerations, I submit the following recommendations.

RECOMMENDATIONS

1. Strengthening of the Regional Structure. A single chain of command from the President and the Board through a new Vice President, Regional Management, Regional Directors, to Section Coordinators.

a. The Vice President, Regional Management, to be responsible for the management of the regions in accordance with the directions given by the Board, the President, or both, as well as for setting goals and standards of performance for the regions, for controlling the performance of the regions, for recommending to the President appointments to regional directorship
from the pool of elected directors, and for recommending to the President changes to appointments when deemed appropriate or necessary. Regional Management includes the numerous other activities now being performed by NCSL directors beyond management of the regions.

b. Increasing the number of directors to three more than the number of Regions.

c. Regional Directors to have the sole responsibility of operating the regions with the assistance of the Section Coordinators whom the Regional Directors appoint for indefinite periods.

d. Each Region to elect directly one director who will be given first consideration for appointment as Regional Director for that Region.

e. The Regional Director to appoint Section Coordinators for a period determined by the director. The Regional Director to be responsible only for matters directly affecting the management of the region or sections, and to provide training, guidance, supervision, and organizational support to the Coordinators.

2. Providing for continuity in Regional Management. Directors to be elected for a period of not less than three years.

3. Alternative. As an alternative, create the new position of Vice-President, Regional Management, with responsibilities as outlined in 1.a above with the exception that this Vice-President appoints the Regional Coordinators based on recommendations by the directors, directors to serve for a period of not less than three years, and no other changes.

Respectfully submitted,
Rolf B.P. Schumacher

Westinghouse Electric Corporation
Specialty Metals Plant
R.D. #4, Box 333
Blairsville, PA 15717

April 18, 1986

To: NCSL Board of Directors

Here's yet another proposal for the Board and Regions to consider over the next quarter:

1. Keep the same number of Directors, elected as they now are elected. Also, don't cut out the next layer of help (Regional Coordinators).

2. Allow more Regions to be carved out wherever sections proliferate. The present Regional numbering system would need to be dropped or modified to ease this. One way is to divide the country into five zones for each Director, which can be subdivided into Regions as seems appropriate. However, this could put artificial boundaries between some adjacent areas (such as Pittsburgh-Cleveland), and would not give a balanced activity load to each Director. Instead, let Regions increase in number through time according to activity (to 10, 20, or whatever), allowing subdivision and annexing.

3. Let Sections be structured as they now are, forming where appropriate and reporting through their Regional Coordinators.

Notes:
- This structure parallels the VP-committee-Subcommittee structure that has been working very well.
- Those who are not member delegates would continue to be eligible to serve as Regional Coordinators.
- An eventual ratio in the future might be 3-4 Regions per Director, with 3-4 Sections per Region.

H. Bryan Werner
NCSL President
The questions surrounding a possible accreditation program for calibration laboratories in the U.S. were examined in two panel discussions and open forums at the 1985 Workshop & Symposium of the National Conference of Standards Laboratories (NCSL) in Boulder, CO, in July 1985, in two workshops titled "Practical Ways of Accrediting Calibration Laboratories". As I had the privilege of developing the workshops, and since they drew a good deal of interest, I wish to summarize here the initial positions of the panelists, salient opinions voiced by the audience, and the final impressions of the panelists. I am indebted to the original panelists, Bard Dunkelberger of Leasametrics, Carl Quinn of BIMCO, Joe Revilla of Rockwell International, Rocketdyne, and Dr. Joe Simmons of NBS, as well as to Peter Unger of NBS who served, at my invitation, as panelist in my place during the second workshop, for their written contributions to this summary. My thanks also to Charlie Hyer, The Marley Organization, and John Locke, then with Organization Resources Counselors, Inc. and new Executive Director of the American Association for Laboratory Accreditation (AALA), for their verbal and written communications with me, contributing to this topic prior to and following the workshop.

I believe the findings to be of considerable relevance to NCSL.

INITIAL POSITIONS

In his initial statement, Bard Dunkelberger expressed his opinion that there may be no need for an accreditation program for calibration laboratories, although the establishment of one may be inevitable; if established, NCSL must be a part of the process. Joe Revilla emphasized the considerable simplification and streamlining of the presently cumbersome process of qualifying calibration laboratories, serving industry at large, which may be the main benefit from an accreditation program, or the only one, though an appreciable one, for the great majority of calibration laboratory customers. Bard Dunkelberger had indicated a similar opinion.

Joe Revilla pointed out that a calibration laboratory accreditation system of sorts already exists, if informal and perhaps crude, among industrial firms doing business with the federal government and subject to government requirements. Such requirements often include that all contractors' and subcontractors' laboratories have a calibration quality program continually audited by contractors and government agencies for compliance with set requirements. This system may be formalized into an accreditation program. Laboratories accredited in this way could even be authorized to accredit others.

Carl Quinn stated that a "valid accreditation program...will not come out of wispy smoke and thin air..." He indicated that he sees such a program "as more complex than NCSL can currently administer. However, he continued, "I believe it is an NCSL responsibility to promote the development of the technical criteria and other requirements which will be necessary to qualify laboratories later seeking voluntary accreditation through a practical program." Carl Quinn is the Chairman of the NCSL Laboratory Evaluation Committee.

Carl elaborated that the "NBS NVLAP has the required administrative system in place and lacks only industry input as to what practical working requirements are necessary for various levels of calibration laboratory accreditation."

My own main points were that the U.S. will probably need some form of laboratory accreditation or national calibration service to attain, for the benefit of foreign trade, a level of confidence in available calibration services which U.S. industry itself does not have at this time. However, a calibration laboratory accreditation program is first and foremost one of quality control (of services), and only secondarily one of metrology; hence it must be conducted under principles and with methods of effective quality control. It follows that the prime responsibility for such a program should go to a quality control oriented organization; agencies such as NBS may provide valuable support. In the U.S., a government agency, highly sensitive to political considerations, likely lacks the organizational climate to provide effective leadership. Hence, a laboratory accreditation program should be conducted by an agency independent of the government. The failure of a first attempt to accredit calibration laboratories seemed to support this position.
Dr. Joe Simmons described NBS participation in recent reciprocal agreements with NPL (United Kingdom) and NRC (Canada) for mutual recognition of the equivalence of certain national standards and reviewed some of the features of national calibration services of other countries. He emphasized that industry establish the lead and that the U.S. develop its own model under the leadership of a "flexible agency."

OTHER POSITIONS

In a letter prior to this workshop, John Locke, previously with NBS, maintained that the problem with the first attempt to accredit calibration laboratories "relates to a commitment by the affected calibration laboratories." Determining what should be done and obtaining a commitment by the affected laboratories, Locke sees both as "very serious problems". He described efforts to interest the military in the possible benefits to them of a laboratory accreditation program. John says, as he understands it, "the Air Force has some concern that such a laboratory accreditation system may not be good enough for their purposes. The system we (at NBS) were trying to develop would certainly be complete and as thorough as the ad hoc arrangements the Air Force now uses in many of its contract and subcontract areas. Perhaps the most difficult problem we faced was lack of enthusiasm of NBS calibration staff for such a calibration service....But I am convinced that the NBS staff is responsive to the needs and concerns of industry and if those needs and concerns were effectively presented and enthusiastically supported, the NBS staff would be willing to support a calibration service."

John outlined what other industrial countries have done in the area of laboratory accreditation or providing a national calibration service and concluded: "It may be that NVLAP is not the appropriate umbrella under which to develop a calibration service and that perhaps a new kind of activity at NBS would be appropriate. It may also be possible for NCSL to develop a laboratory accreditation program. The key to such an independent program, however, must be a direct link to calibration services at NBS at the highest level."

Peter Unger, Associate Manager, Laboratory Accreditation, NBS, attended the workshop, having been provoked by the announcement: "Recent experience has shown that the methods used to accredit product testing laboratories in the United States cannot readily be applied to accrediting calibration laboratories." He maintains: "Accrediting calibration laboratories is not fundamentally different from accrediting product testing laboratories...laboratory accreditation is a recognition of competence to perform specific tests...

"...If NCSL were to take a positive stand supporting a national calibration accreditation system, progress is possible. NBS will not aggressively pursue such a system without NCSL support."

Privately, Peter indicated that NBS' NVLAP group is confident that it could get any specialized support it will need to discharge its responsibility, including hiring outside consultants if necessary. The planned electromagnetic calibration LAP (Laboratory Accreditation Program) was not proposed as his group had intended.

Peter ascribed the failure of that program at least in part due to such influences. This, in turn, strengthened my own feelings that an agency of the federal government would not be in a good position to take full charge of a laboratory accreditation program.

In the TMO Update - National and International Developments Concerning Product Certification, Laboratory Accreditation and Standardization of May 15, 1985, Charles W. Hyer opines:

"...NBS's NVLAP has been unsuccessful in two attempts at developing a laboratory accreditation system to cover calibration services (Electromagnetic and Pressure)...a hindsight review reveals the failures as quite predictable. NBS as THE U.S. National Measurement Laboratory protects its image as a laboratory that advances the state of the science of measurement. To protect its image unless provided with a defined scope by some greater authority NBS measurements people will not prepare for NBS OPSP or NVLAP laboratory accreditation system--procedural guides and assessment services procedures--of a type or level that will not enhance their measurement capabilities image. In the two cases cited this has led to financial cost estimates clearly out of proportion to the economic value of such accreditations -- to the preponderance of potential accredited participants.

"After providing the above a few points are pertinent. These NVLAP failures do not support NCSL's workshop program suggestion: 'that the methods used to accredit product testing laboratories in the United States cannot readily be applied to accrediting calibration laboratories'. It just means that NBS measurement people were not motivated to NVLAP in two specific
Lab Accreditation

cases. Until criteria that is now used to accredit product testing laboratories among the 108 published reports in our Principal Aspects of U.S. Laboratory Accreditation Systems (PAUSLAS) is examined any methodology judgement is premature.”

In a subsequent telephone conversation, Charlie Hyer said: “I hope that the belief that ASQC can’t do it and NCSL can’t do it will not lead to an excuse for the NBS to do it.”

RESPONSES

Responses from the other workshop participants covered the entire gamut, providing support for most stated positions. Numerous difficulties were seen with Joe Revilla’s suggestion that accredited laboratories may be authorized to accredit others. Joe also detected widespread uncertainties, even doubts as to the feasibility of laboratory accreditation programs as proposed so far, arising from the question of what basic criteria were to be used for accreditation: a quality system approach, or an examination of measurement capability for each discipline and range, or a combination of these?

Bard Dunkelberger found that the discussions “confirmed my beliefs and yet gave me the impression that most of the lab managers do not care.” Many in the audience were “concerned about the political and economic costs to accredit; we, NCSL, must form a panel or a committee to make sure some other agency does not make the rules for us…”

Peter Unger noted that a representative from Hong Kong, echoing Joe Revilla’s suggestions, “...could not understand the negative position taken by some against a national system when they also complain about multiple redundant on-site assessments of their facilities by various government agencies and contractors. He indicated that a national calibration accreditation system tied in with NBS and supported by NCSL would go a long way toward providing a basis for reducing multiple assessments as well as providing U.S. laboratories with international recognition.”

Peter advised me that he will be conducting a workshop, at the 1986 annual NCSL Conference, on laboratory accreditation systems abroad. Past NCSL Conferences have already provided us with insights how this question is handled elsewhere. Interestingly as such review may be, it is questionable how much may be applicable in the U.S., given the unique political climate of the U.S.

Carl Quinn believes to have found from the audience response:

“...guarded acceptance of the concept of an accreditation program for calibration laboratories with some good cautionary comments such as the former DCSAR individual who attested to the rank subjectivity he encountered in the evaluations by his colleagues of U.S. Air Force Laboratories in Europe.

“...Major industry support was identified as being required before any calibration lab accreditation could succeed.

“...The DOD and Tri-Services personnel in the audience raised some good questions and made comments which seemed to acknowledge possible savings by DESC and DCAS if an accreditation would include verification of conformance to the necessary Government standards and specifications such as the MIL-STD-45662.

“I have come away from the panel with some belief in a new approach which treats laboratory operating systems accreditation separately from proficiency verification.

“First, the laboratory might be approved for operation in conformance with the specification requirements for the administration, personnel staffing and facility as required for example in MIL-STD-45662. This accreditation would satisfy a large portion of the current audit requirement for government contractors and subcontractors without addressing the issue of proficiency. The time saved by eliminating redundant audits of calibration laboratories would be considerable.

“Second, the laboratory wishing to qualify for calibrations at state of the art or verified proficiency level must participate in a proficiency test program such as MAP to verify the uncertainty of calibrations for the parameters of interest. The results of this higher second level program would be reviewed by the audit staff and/or NBS experts to establish a proficiency level.”

Carl advised me of an experiment in cooperative calibration laboratory evaluation he is organizing with eight calibration laboratories after having been contacted by Mr. Harvey Berger, Manager of the Laboratory Accreditation Program, Office of Product Standards Policy, NBS. Carl notes that this “...activity could be encouraging to those interested in reducing multiple audits.” The DOD has been apprised of this experiment.
WHAT DID WE LEARN?

The workshops were well attended and enjoyed lively and extensive participation by the attendees, attesting to the high level of interest in this question among NCSL membership. While there was a wide variety of opinions about many details of the problems and possible solutions, majority opinions seemed to emerge on a few key points.

Most seem to believe that a calibration laboratory accreditation program or establishment of a national calibration service will be necessary for reasons of foreign trade alone or will at least be inevitable. Secondly, such a program could possibly help in solving the redundant evaluations problem faced by many calibration laboratories. Opposition to such a program seems to be fading as the discussion continue but is by no means dead. NCSL was, time and again, mentioned alternately as the only, or best positioned, or most logical, or one of the most qualified organizations to take the lead in organizing and operating a calibration laboratory accreditation program. The cooperation of NBS in support of such a program also was acknowledged by most to be necessary or at least highly desirable.

To Carl Quinn, it "...is clear that more NCSL delegates and conference attendees have [achieved] a greater understanding of the pros and cons of the laboratory accreditation issue as a result of this panel." In addition, more and more voices are calling for increased NCSL initiative in this question.

In summary, it appears that NCSL has attained a unique position in the field of standards and calibration laboratory activities which brings with it responsibilities that accompany that position. Nearly everybody expects NCSL to take a leadership role in the question of calibration laboratory accreditation. The question is now: Will NCSL be up to the challenge?
A (Modest) Proposal to Establish a National Bureau of Microwave Standardization

By
John L. Minck
Concerned Microwave Citizen

(I know this story is highly presumptuous, but it has some considerable national importance, and I am writing it with my tongue tucked well in cheek.)

Here's the scenario: Tomorrow morning, as the 3,000-plus employees of the U.S. Commerce Department's Bureau of Standards drive to work at their sprawling campus in Gaithersburg, Md., or the imposing facility tucked up against the Rocky Mountains in Boulder, Colo., they find to their amazement that both facilities are gone. Since this is my scenario, I don't have to explain how or why it happened. Let's just consider it my version of zero-based budgeting.

Well, you can imagine, in such an emergency, and after dismissing the employees for the day, the owners and operators immediately got together in a hastily called meeting to decide what to do. In attendance were: Dr. Ernest Ambler, director of NBS; the Honorable Malcolm Balderidge, secretary of commerce; the Honorable James Miller, director of the Office of Management and Budget; Representative Douglas Walgren, D-Pa., chairman of the House Subcommittee on Science, Research, and Technology (with oversight on NBS); and Senator Slade Gorton, R-Wa., chairman of the Senate Subcommittee on Science, Technology, and Space.

Prudently (as you or I might do on rebuilding a company facility), before dusting off the original drawings and calling for construction bids, they decided to call a national meeting of all interested parties to help them decide how to rebuild.

Meanwhile, back at their temporary offices, their phones were ringing off the hook. The word had gotten around and it seemed as if every acronym in the world was calling in to check on the situation—IEEE, NASA, DOD ISO ASQC, AMA, ANSI, ADA, ASTM, ASME, IEC, FAA, two NCSLs (National Conference of State Legislators and National Conference of Standards Labs), UL, API, OIML, APS, etc., etc., etc. And aerospace and industrial labs called, and the universities, and the trade associations, and all 50 state weights-and-measures labs.

Could it be that one small federal agency could have such a pivotal effect on thousands of organizations? Indeed it could. And it does! In a real sense, much of the industry and technology of our country depends on NBS—for quality, productivity, and technology underpinning.

We put communications satellites in orbit to enrich our lives and make business more productive. We navigate our airplanes with remarkable safety and reliability. And we now build our automobiles with robots and automated machine tools, with laser dimensional measurements feeding into sophisticated statistical quality control. Medical lab technicians calibrate their blood-characterizing instruments with precisely calibrated samples of NBS SRM liquids. Pollution-chasers measure levels of air-contaminants against precise mixtures of air pollutants from NBS. NBS is there, literally, in the middle of all of those economic and technical transactions.

Well, the real resources of the bureau—the wonderful amalgam of hundreds of Ph.D.'s, engineers, scientists, statisticians, material scientists, technicians, and machinists—are at home enjoying an unexpected but well-deserved respite. That human resource is absolutely unique. And it's not just the individuals, it is the combination of specialties and the interdisciplinary approach that has served the nation so well.

A National Measurement System
With NBS as the Lead Agency

We've got to begin rebuilding a Bureau of Standards. That's directed by the founding act of Congress, the "Organic Act of 1901." And in our Modern Technology Age, measurement science and the measurement standards underpinning our economy are an enormous giant. A mid-1960s study by Ray Sangster—who studied the size of the National Measurement System (NMS) (a concept developed in 1967 by Dr. R.D. Huntoon)—showed that perhaps 6 percent of a million-million-dollar GNP in those days was a mind-numbing $60,000 million.

Yet, no one truly is in charge of this NMS.

A November 1984 study by Pasqual Don Vito' more accurately defines the measurements part of the U.S. GNP as being 3.5 percent of a now $4-million-million total. This yields a figure of $161,000-million for the measurements sector, including labor and equipment. And still, no one is in charge. The economic effect of measurements is hard to realize. One example I always remember is this: If you make a 1-percent error measuring the moisture in grain, either the farmer or the grain buyer gains in a $500-million mistake for (in effect) buying or selling water each year.

So, let's start with the Organic Act for some basic reasons for our new Bureau to exist.

(a) The custody, maintenance, and development of the national standards of measurement, and the provision of means and methods for making measurements consistent with those standards, including the comparison of standards used in scientific investigations, engineering, manufacturing, commerce, and educational institutions with the standards adopted or recognized by the Government.

John L. Minck has worked in measurements and instrumentation since 1952, and with Hewlett-Packard Co. since 1958. He is editor of the NSCL Newsletter, the publication of the National Conference of Standards Laboratories, an association with its focus on metrology and calibration.

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MSN & CT MAY 1986
Only after the establishment of the standards and structure for dissemination of the measurement services should the bureau build the many other programs that it does so well, for example:

1. standard reference material program—a powerful and innovative way of tying a measurement loop around chemical, analytical, and other tests;

2. standards-writing functions—where NBS works in conjunction with the large number of private-sector standards agencies;

3. pre-eminent meeting facilities and hosting—with hundreds of high-technology interchanges between NBS and industry and academia; and

4. publications—a national resource of knowledge.

My Priorities, Your Priorities

As soon as we leave those programs on standards, the picture gets much more cloudy. Clearly, the standardization mandate requires a research function that is second to none; and NBS has had world-class research programs for years. However, the budget-bashing of recent years, along with new congressionally mandated programs, has caused deterioration of this national resource.

NBS's strength, unfortunately, also creates a problem. During the past 15 years, the NBS has been asked by Congress to serve as a "National Job Shop." It has ranged from proximity-fuse research in World War II to "burning baby blankets" during the 70s’ consumer-safety era. The NBS programs on fire research, and building and construction standardization, are unquestionably tops in the world. The computer-science programs serve critical needs on standards and security. But do all these crucial programs belong at NBS? Or could they belong just as well at some of the other 73 U.S. national research laboratories? How about the projects for increasing U.S. productivity: robotics, semiconductor technologies, the cold-neutron reactor project? How about programs dealing with medical and pharmaceutical technology? It would seem to some of us that at least some of these might belong at NIH or elsewhere.

But the opposing argument is intriguing, too. The very interaction of all of these disciplines in one organization creates serendipity. Pursuing basic knowledge with multidisciplined people results in highly practical fallout. For example, NBS Boulder scientists zeroing in on a more accurate figure for the speed of light realized that one limitation of their measurement was due to the antenna-aperture effects of the light-wave launch antenna. In learning how to describe mathematically the near-field effect, and thereby supply corrections, the microwave near-field antenna range was born. This remarkable computerized facility probes the complex wave across an antenna and predicts with amazing accuracy the far-field pattern. More than 20 ranges have already been installed in ten aerospace companies.

In another example, industry reported continuing problems getting consistent data on the mundane "lead-pull" test for semiconductor bonding. In trying to understand the problems better, an interdisciplinary team of metallurgy and materials-science people were able to make several fundamental improvements to the metals-interface and the bonding-process parameters. This resulted in a 3:1 improvement in the bond strength itself, a benefit industry now receives—with all of us getting better ICs.

So now come the resource allocations. I guess most of the readers of MSN & CT would have to agree that RF/microwave/millimeter standards are crucial. With all the various constituencies and factions looking for their share of the NBS budget, it's a tough judgment call for the director and the congressional oversight committees. But I think they are the ones who should hear our call. There are probably 100 to 200 different constituencies and factions looking for their share of NBS activity. And within NBS itself, the science faction may put too much emphasis on pure research and ignore the delivery of standards services.

What hurts most is the attitude of the OMB and Congress that the NBS $125-million budget is somewhere near adequate to do the job of the "lead agency" of the National Measurement System. DOD probably spills $125 million on most programs. (Nothing personal.) If anyone asks me for my vote on appropriations, I'd start by doubling the present figure of $125 million. I feel our money is well-spent at NBS. While I'm not privy to national priorities at the OMB level,
Soviet Metrology

WILLIAM A. BURHANS
RUSS-ENG Translations, Inc.

Modernization programs currently being implemented within the Soviet Armed Forces are designed to insure that the Soviet military is equipped with the latest, most mission-capable weapons systems and equipment. As this upgrade process continues, it focuses attention on military metrology, a vital but little-studied element in the Soviet military structure. A support element, it does not directly put weapons on a target. Without it however, full employment of weapons and equipment in wartime is impossible.

Military metrology “is a branch of general metrology studying problems of the unity and precision of measurements made for purposes of insuring combat readiness, the reliability of military weapons and equipment, and unit (formation) combat readiness. Metrology accomplishes the missions of metrological support for the development, production, and maintenance of weapons and military equipment.” A component of special technical support (along with nuclear, missile and general technical), metrological support is a “complex of measures directed at the achievement of the requisite quality and precision of measurements, and instrument monitoring of the measured parameters of weapons and equipment, to maintain them in constant combat readiness. It includes measurement equipment inspection, adjustment and repair, supplying measurement devices to the forces, and training cadres of military metrologists. The fact that overall direction of Soviet military metrological efforts resides at the Ministry of Defense level underscores the vital importance the Soviets attach to this seemingly mundane profession. During the 1970s, they established the Metrological Service. It is charged with the organizational and technical supervision of all metrological affairs, establishment of the equipment inventory, unification and standardization of this equipment, monitoring its working order and ordering and supplying it to the forces and defense institutions. The Metrological Service also develops requirements levied on weapons and military equipment models and furnishes metrological expertise in this area. It is charged with monitoring the support provided at all levels of the Soviet military.

Metrological support is not viable without competent well-trained personnel in the field. Soviet military metrologists are trained within the system of military educational institutions, a prominent example being the N.I. Krylov Kharkov Higher Military Command-Engineer School of the Missile Forces. This institution prepares engineer-metrologists using a six-stage professional training system: general science, theoretical, elemental instrument-making base, instruments, systems, and maintenance. Students receive the opportunity to gain practical experience during the final stage. They spend time in the country’s leading instrument-making enterprises, where they familiarize themselves with the basic stages of the design, production, and metrological certification for various types of electronic and radio measurement equipment. In addition, they further strengthen their skills through on-the-job training during temporary duty with military units in the field.

Efforts are made during the last two years of the four-year course to take advantage of the knowledge and skills students acquire. They are involved in military scientific work, with their research and design results carefully scrutinized by the school staff. Patents are applied for in the event any worthy inventions result, and useful items or procedures are introduced (when warranted) throughout the Ministry of Defense.

Individuals who successfully complete the course, pass the final examinations and do well in their on-the-job training in active units, are graduated as engineer-metrologists. This immediately allows them to perform the functional responsibilities of an engineer and state inspector.

The professional military metrologist, whom we refer to as a precision measurement equipment specialist, plays an unsung but extremely important role in the Soviet scheme. He insures that all weapons and equipment in the Soviet inventory meet rigid metrological standards.

REFERENCES available from the Journal of Electronic Defense.
MEASUREMENT UNCERTAINTY TRAINING COURSE

Introduction

This course will provide instruction in the nature of errors and the methods used to determine the uncertainty of a system or process. Programs for measurement assurance will be discussed as well as methods that can be used to control the quality of a measurement.

Who Should Attend?

This training course will benefit managers, engineers, designers, technicians and quality control personnel who are involved in measuring, determining system performance, calibrating instruments and evaluating system uncertainty and traceability.

Subjects Covered

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* Uncertainty of the mean
* Confidence level
* Student's training
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* Control charts
* Warning limits - action limits
* Quantifying uncertainties of reference standards
* Check standards
* Controlling uncertainties of reference standards
* Trend charts
* Least squares line fitting
* Changing nature of systematic and random errors
* Propagation of errors
* Combining of random and systematic errors
* Total uncertainty
* Uncertainty statements
* Calibration control systems
* Calibration interval analysis
* Traceability to higher level standards
* Measurement assurance
* MIL-STD-45662 and other standards and regulations
* ANSI/ASQC standard on calibration systems
* Analysis of individual student applications

Instructor - Rolf B. F. Schumacher

Rolf Schumacher is a Senior Metrologist at Rockwell International, Anaheim, Calif. His main responsibility is with the engineering, quality, and procedural aspects of the calibration control system.

Class Schedule

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Tuition

Tuition for each 5-day training course is $795 per person.

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Payments may be made by company purchase order or check, personal check, or Form 1556 (for Military or Government employees).

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A full refund will be made only if reservation is cancelled not less than 7 days before the course starts.
## ADDITIONS TO TRAINING DIRECTORY

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<td>Sep 8-12</td>
<td>Stanford Park Division, Palo Alto, CA</td>
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<td>Colorado Springs Division, Colorado Spr., CO</td>
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Earl Amano, Chairman
Training Director
EDITOR'S NOTE: With Secretary Chet Orme's plan to abbreviate the Board minutes, I will begin including Liaison reports in this Committee Reports section.

AD HOC COMMITTEE REPORT ON ORGANIZATION OF AN EQUIPMENT MANAGEMENT FORUM

Sequence of Events

1. December 1, 1985 - Letter from Gary Davidson to Board of Directors (BOD) proposing the organization of an Equipment Management Forum within NCSL.

2. January 1986 BOD Meeting - "Go Ahead" received to proceed on the Equipment Management Forum as an ad hoc committee.

3. February 19, 1986 - Meeting held at TRW, Redondo Beach, California to consider forming an association of organizations involved in equipment management. There were 16 attendees representing the following organizations:
   - TRW/O&S
   - Lockheed Missiles & Space
   - McDonnell Douglas Aircraft
   - Boeing Aerospace
   - General Dynamics/Convair
   - Hughes Aircraft
   - McDonnell Douglas Helicopter

4. Meeting Results:
   - Developed a proposed charter
   - Agreed to formation as a committee of the NCSL
   - Established a non-restricted membership, i.e., an open forum
     Elected interim co-chairmen:
     - W.E. (Bill) Martin
     - Lockheed Missiles & Space
     - G.M. (Gary) Davidson
     - TRW/O&S
   - Scoped the meeting frequency at 2 or 3 times per year
   - Scheduled the next meeting:
     - Open Meeting (first forum meeting)
     - May 1986
     - Sunnyvale, California
     - Host Organization - Lockheed

5. February 24, 1986 - Detailed summary of the February 19, 1986 meeting released to attendees and to the BOD under status report letter from Gary Davidson.

6. March 6, 1986 - Article entitled "Equipment Management Forum" provided by Gary Davidson for publication in the April NCSL Newsletter. The article highlights the above stated activities and gives an open invitation to attend the first Equipment Management Forum meeting in May. The meeting's agenda and particulars on lodging, reservations and contacts are included.

7. March 7, 1986 - Notice of the May 22, 1986 "Equipment Management Forum" meeting forwarded by Gary Davidson to the secretariat for subsequent release to all member delegates. The meeting's purpose, agenda, lodging particulars and general information were defined including a meeting reservation form and map defining the meeting location.

Results of the May 22 meeting should indicate the degree of interest, need and enthusiasm existing for this activity. As such, we hope to determine the near term potential for conversion of the committee from an ad hoc to a standing committee status.

Charlie Sides
Ad Hoc Committee Member

This report summarizes a meeting at TRW, Redondo Beach, California, on February 19, 1986. The purpose of the meeting was to consider forming an association of organizations involved in equipment management. In attendance were:

G. Tom McGovney
J.F. Mathwig
James M. Ingram, Jr.
Otis Henley
Jack Simpkin
W.H. Adams
Charles B. Husit, Sr.
R.C. Davison
Jim L. Miller
J.L. Weldon
Gary M. Davidson
Arnie Doll
R.A. Young
Charles A. Sides
W.E. Martin
Dale Kemper

TRW/O&S S/2767
Boeing Aerospace
Lockheed Missiles & Space
General Dynamics/Convair
McDonnell Douglas
Hughes Aircraft
McDonnell Douglas
M/C 26-11
Hughes Aircraft
McDonnell Douglas
M/C 41-11
Douglas Aircraft Co.
TRW/O&S S/2767
Boeing Aerospace
Boeing Aerospace
Lockheed Missiles & Space
McDonnell Douglas
Helicopter

The proposed charter of the association, as developed at the meeting follows:
EQUIPMENT MANAGEMENT FORUM

CHARTER

An association consisting of representatives of organizations with interest in, or involved in management of test equipment, related equipment, and systems. The purpose of the association is to promote cooperative efforts in advancing management concepts through exchange of information. The objectives of the association and its members will be met through meetings, workshops, surveys, publications, and points of contact.

A discussion was held regarding forming this association as a committee of the National Conference of Standards Laboratories (NCSL). This was viewed as the current most viable approach by a majority of the attendees. Some of the advantages of forming within the NCSL are:

- Established tax exempt organization.
- Mechanisms already in place (by-laws, organization, information manual, administration manual, etc.).
- Seed money.
- Source of membership/points of contact.
- Quarterly Newsletter.
- Annual conference.
- In a constant strong growth mode.
- Strongly supported by corporations/organizations.
- Paid staff (October, 1986).

The group's position regarding NCSL is--should that relationship not be beneficial to the NCSL and the equipment management community, the Equipment Management Forum would: splinter off as an independent association, or consider affiliation with other organizations.

Membership was also discussed. Should it be open to anyone with interest, or restricted to certain organizations involved in equipment management? The majority consensus was for an open forum.

Then a solicitation was made of the group for an interim committee chairman, W.E. (Bill) Martin, Lockheed, Sunnyvale, and Gary Davidson, TRW, Redondo Beach, were volunteered and accepted as co-chairmen.

The group also discussed the next meeting. This would be an open meeting, the first meeting of the forum, tentatively scheduled for one day during the week of May 12, 1985, in Sunnyvale, California. Announcements will be sent to our current listing, and the NCSL member list. The consensus of the group was that the forum should initially meet two or three times per year.

Gary M. Davidson, TRW
Ad-Hoc Chairman

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NCSL ORGANIZATIONAL STRUCTURE - AD HOC COMMITTEE REPORT

At the last NCSL Board of Directors Meeting in Pittsburgh, I reported that I wrote to all the NCSL Directors and Region Coordinators soliciting inputs on the proposed reorganization of the NCSL structure. At the time of the board meeting, several region/section coordinators had not had a chance to discuss this subject at region/section meetings.

Some of the concerns I raised with a restructure were:

- What's wrong with the present structure?
- Where are we having problems and concerns?
- If minor concerns are of issue, does it have merit for restructure?
- Would restructure really enhance the organization?

The following list of thoughts came out in an open brainstorming session concerning the proposed restructure.

- Membership growth and organization activities
  - Growth in one area opposed to other areas
  - Growth nationally
- Directors with vested interest in regions
- Elect within the region
- Strengthening the "Grass Roots"
  - Elevating status of region/section leadership
- Too much work for directors (if we remove the region coordinator layer)
- Delegate downwards
o Sections don't want to be elevated
  (status quo)

o Difficult to get elected Directors from
  some regional areas.

o Directors, direct NCSL overall (assist
  regions and assignments)

o Region/Sections need control from Board
  of Directors

o Non-member delegates elected to the Board
  of Directors

o National election of Vice Presidents
  first

o Sections (some may or may not have the
  following concerns)
  - Lack of (or filtered) information
  - Lack of status/reorganization
  - Geographic proximity of Directors

The Board of Directors would like to know
from the regions or sections if there are
any concerns you might have on the re-
structuring of the organization. Your
thoughts--for, against, in addition to--are
solicited both from the regions/sections and
as an individual.

Bill Simmons
Director, Regions 4 & 6

* * * * * * * * *

LABORATORY MANAGEMENT REPORT

1. Participated with the NCSL Government
  Affairs Committee/Team in drafting
  material for the March House Subcommittee
  on Science, Research and Technology. The
  material and subsequent testimony focused
  on critical elements of the NBS FY1987
  budget.

2. There has been considerable interest
  expressed to establish a separate com-
  mittee on calibration intervals. This
  is, in part, due to considerable research
  and experiments conducted in the past few
  years in this area and the increase in
  variety of systems being developed and
  used. A focused effort now could improve
  this critical area for our membership.
  The proposed charter for the committee
  under Lab Management is attached for
  appropriate action. Dr. Howard Castrup
  of Science Applications International
  Corporation has volunteered to chair this
  committee. For those who are interested
  in joining this committee, Dr. Castrup
  can be reached at (714) 623-6711 or by
  mail:

Dr. Howard Castrup
Science Applications Int'l Corp.
300 South Park Avenue, Suite 950
Pomona, CA 91766

D. H. Caldwell
Laboratory Management Committee

* * * * * * * * *

PROPOSED CHARTER FOR CALIBRATION INTERVAL
COMMITTEE

To college, develop and disseminate informa-
tion on calibration intervals for test
equipment and standards in order to promote
improvements in the assessment and manage-
ment of test equipment quality. This would
include mathematical, statistical, sci-
cientific and administrative parameters and
guidelines necessary for the assessment of
test equipment reliability, establishment
and adjustment of calibration intervals and
the determination of failure modes.

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EDUCATION LIAISON COMMITTEE QUARTERLY REPORT

NBS cancelled their electrical measurement
assurance workshop scheduled in San
Francisco on April 13-18. A minimum of 28
registrations was necessary and only 18 were
obtained. They plan to reschedule the work-
shop to October of 1986 and move it to the
more centrally located San Jose area.

Since about half the participants in past
programs have not been from the local area,
NBS feels that they may be approaching a
saturation point and are planning to change
to a once-a-year schedule at different loca-
tions. However, if there is sufficient
demand they can schedule a workshop on two
or three months' notice.

The Measurement and Control Center, a part
of the College of Engineering at the
University of Tennessee, has 40-50 students
involved in measurement science courses on
the graduate level. This is a joint uni-
versity/industry cooperative research center
involving the University of Tennessee,
Knoxville, and Oak Ridge National Lab-
oratory.

The training program at Hutchinson is flour-
ishing with 30+ students projected for next
year. They have received state authoriza-
tion to develop a physical-mechanical
program, but no funding.
Committee News

Efforts to develop a program at Allen Hancock Community College in Santa Maria, California, need more support from industry. Walter Umplett is our contact point with them.

Butler Community College will be having their annual Metrology Fair on April 24 and 25. They will be having summer seminars on statistics, S.P.C., nondestructive testing, pressure/vacuum and electrical measurement.

Workers in metrology function on different levels and there is at present no accepted terminology to describe these levels. Graduates of the University of Tennessee program, Butler and Hutchinson are not interchangeable. As long as they are all classified as "graduates of metrology programs" there will be confusion and disappointment on the part of both graduates and employers. I would like to conduct a survey to determine if a consensus in terminology is possible. The survey would have a multiple choice type of format using definitions from government, industry and education.

Kate Webster
Chairperson
Education Liaison Committee

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MEASUREMENT ASSURANCE COMMITTEE REPORT

I. Region 8 Group 2 Volt MAP repeat:

Due to problems with the NBS transport Standard, the MAP had to be repeated, with Ford acting as pivot lab this time. Preliminary data have been sent back to participants, so the test report should not be too far behind.

II. Region 8 Group 1 getting ready for Volt MAP:

Two years after the last one, Group 1 will go at it once more. Some of us have had to rattle our cells to shake out problems. (See item IV below.)

III. Region 1 willing, but not ready yet:

Harry Haynes reports that some hardware problems still remain to be cleared up in several of the labs interested in doing a Volt MAP.

He may have to start the first MAP on his own.

Are you fellow really going to let Harry get a head start on you?

IV. Shock treatment for unstable cells?

Standard cells that sit for years may become so unstable and noisy as to be useless, while others appear to be just fine. When the box is disturbed, one or more of the "just fine" ones may jump by several microvolts and take anywhere from days to months to settle. Also, some of the unstable ones may become useful again.

None of this is new, but few, if any, of us have "exercised" our cell boxes regularly to try to prevent such problems. The late George Vincent apparently used to beat on recalcitrant cells so hard that bystanders were afraid the cell might break.

I don't know if George left any notes or passed his knowledge on to someone, but I would be happy to hear from anyone who can contribute some helpful information on the subject and share it with the gang.

Arno Ehman
Chairman

* * * * * * * * *

NCSL-IECQ LIAISON REPORT

1. The U.S. EECB (Electronic Component Certification Board) management group are having their annual meetings at the Marriott in Washington, DC, on April 17, 1986.

2. A small update: The complete international IECQ has as of this writing a total of eighty-two (82) approved manufacturers. Of this total, eighteen (18) are U.S. approved manufacturers or approximately 22%.

3. Except for a continuous growth in specification base and manufacturers' approved products, the U.S. IECQ's noteworthy changes are occurring at a very slow pace.

Timothy D. Driver
NCSL-IECQ Liaison

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CORM LIAISON REPORT

CORM-86 - Will be held at the National Bureau of Standards, Boulder, Colorado, May 13-14, 1986
I. INTRODUCTION

The Radiometric Physics Division of the National Bureau of Standards has requested the Council for Optical Radiation Measurements (CORM) to provide them with a priority list of technical issues in the area of spectroradiometry that we believe most urgently need to be addressed in order to most effectively serve the groups in industry, government, and academia that are dependent on this measurement science. This request was made to assist them in carrying out the measurement science. This request was made to assist them in carrying out the program in spectroradiometry that is expected to be funded at the Bureau as a result of the Process and Quality Control initiative that was submitted to Congress.

CORM has provided such information to the Bureau periodically over the years in four CORM Reports to the National Bureau of Standards, the latest of which was issued in August, 1982 [1]. This present report is an updated version of the Radiometry section of the Fourth CORM Report, and was prepared by the Radiometry Committee of the CORM Board of Directors to take into account new information that has become available since 1982. We have reviewed the Fourth CORM Report in retrospect and evaluated the progress made in meeting its objectives, whether the needs that existed in 1982 are being met, whether new approaches have become available since 1982, and whether there are new measurement needs that were not perceived in 1982. The objectives of the Fourth CORM Report were placed on the table with new ones generated by the committee, and a prioritization was carried out in the manner used previously, ranking the proposed objectives according to a grading system that takes into account:

1) degree of need: breadth and depth of need;

2) appropriateness: compatibility of the proposed program with CORM-NBS objectives;

3) probability of succeeding in the objective of the proposal within the framework of reasonably possible CORM-NBS resources;

4) immediacy or urgency of need.

The results of this prioritization are presented in the following two sections. A summary of the results is presented in Section II, and a description of the recommended proposals is provided in Section II.

II. SUMMARY OF THE RECOMMENDATIONS

The Fourth CORM Report contained seven proposals for programs to be carried out either by the NBS, CORM, or jointly in order to meet the most important measurement needs at the time of the preparation of the report. For our updated prioritization, new proposals were solicited from the CORM Radiometry Committee, and six were forthcoming. There was quite a bit of mutual overlap between some of these, and between some of these and the seven proposals from the Fourth CORM Report. After eliminating the redundancies, seven proposals remained. The scores of these proposals in the prioritization fell into two clusters. The highest ranking cluster of three proposals has been designated as Priority 1, and the second cluster of four proposals has been designated Priority 2, as summarized in Table I, where the seven priority proposals are listed in order of their rankings along with their priority designations.

An additional recommendation is made regarding staffing. We believe that a recently graduated Ph.D.-level scientist with a degree in optical physics or optical engineering should be hired to provide some of the additional staffing that will be necessary for carrying out the spectroradiometry program. This is an opportunity to help balance the age distribution of the division and therefore to assure long-term continuity of the valuable services provided by the NBS in radiometric physics.

Table I
CORM Radiometry Proposal Titles and Priorities

<table>
<thead>
<tr>
<th>Proposal Identification</th>
<th>Priority</th>
<th>Proposal Title</th>
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<tbody>
<tr>
<td>AK-1</td>
<td>1</td>
<td>Spectral Irradiance Standard to 2.5 Micrometers</td>
</tr>
<tr>
<td>CH-1</td>
<td>1</td>
<td>Detector Based Radiometric Standards and Measurements</td>
</tr>
<tr>
<td>RB-1</td>
<td>1</td>
<td>Total Geometric Spectral Flux Standard</td>
</tr>
<tr>
<td>WS-2</td>
<td>2</td>
<td>Near Infrared Detectors</td>
</tr>
<tr>
<td>WS-1</td>
<td>2</td>
<td>Develop Low-Light-Level Calibration Standards</td>
</tr>
<tr>
<td>AK-2</td>
<td>2</td>
<td>Spectral Radiance Standard to 50 Micrometers</td>
</tr>
<tr>
<td>RB-2</td>
<td>2</td>
<td>Diode Array Radiometry, Colorimetry, and Photometry</td>
</tr>
</tbody>
</table>

III. PRIORITY PROPOSALS

AK-1: Spectral Irradiance Standard to 2.5 Micrometers (Priority 1)

This proposal was the top priority proposal in the Fourth CORM Report. It deals with the problems arising from the fact that the latest and most accurate irradiance scale provided by the NBS in 1973 covers the range from 0.25 to 1.6 micrometers. The increased accuracy was achieved at a sacrifice in the range of the scale, which previously had extended to 2.5 micrometers in the infrared. Because of the many users of this region of the spectrum, users and calibration laboratories have attempted to combine these two scales, which are not consistent in their region of overlap. This has resulted in uncertainty and confusion, and CORM, in its fourth report, requested NBS to develop a new scale over the full range. A considerable amount of progress has been made by the Bureau toward this objective [1], and CORM continues to support these efforts.

CH-1: Detector Based Radiometric Standards and Measurements (Priority 1)

This is an outgrowth of proposal ES-3 of the Fourth CORM Report [1], but it takes into account the many developments that have been made in detector radiometry since 1982. A major technical barrier to the implementation of detector radiometry is the need for stable, well characterized narrow band interference filters. Recent developments have raised expectations that such filters can be achieved. The NBS should continue to evaluate new types of filters and refine the characterization of filters with laser spectrophotometry, in particular studying the effects of linewidths and of the collective effects of filter-detector combinations. The current NBS program for evaluation and characterization of newer silicon photodiodes, as well as other types, is also essential. The physics of these diodes must be understood, the NBS relationships with the manufacturers must be continued to achieve the broad impact that can result from detector radiometry.

RB-1: Total Geometric Flux Standard (Priority 1)

The objective of this proposal is to develop a standard of total geometric flux for use in calibrating integrating sphere radiometers that are used for measuring total luminous flux and chromaticity of discharge lamps. This proposal relates to proposal ES-2 of the Fourth CORM Report for developing a sustained source of radiometric standards with rapid accessibility for the lamp industry. NBS has been working closely with the lamp industry through the Lamp Testing Engineers Conference (LTEC) to meet this need, and the approach of utilizing an intermediate calibrations laboratory has been selected. Total geometric flux standards are needed to complete the required transfer of standards from incandescent sources to discharge lamps, and this proposal addresses that issue.

WS-2: Near Infrared Detectors (Priority 2)

This proposal from the Fourth CORM Report survived intact. The need for stable, efficient detectors for wavelength range from 0.9 to 1.7 micrometers for high accuracy radiometry still exists. The NBS has expended considerable effort in this area in the past few years, both in extending the useful range of silicon detectors to the IR, and in supporting the development of new detectors having inherently longer wavelength response. CORM reiterates its emphasis of the need for developments in this region of the spectrum which is being used for an increasing number of applications.

WS-1: Develop Low-Light-Level Calibration Standards (Priority 2)

This proposal intact from the Fourth CORM Report, is based on the wide need for calibrations at irradiance levels 5 to 10 decades lower than the levels of existing standards. It is difficult for users and calibration laboratories to verify linearity of their instruments over such a wide range.
and the availability of low irradiance standards would greatly reduce measurement uncertainties. Specifically, a standard in the visible region of the spectrum, providing irradiance values of about 10^-15 W cm^-2 nm^-1 would be enormously helpful in solving these problems.

AK-2: Spectral Irradiance Standard to 50 Micrometers (Priority 2)

This proposal from the Fourth CORM Report survived the latest prioritization, perhaps because of the current increased interest in radiation thermometry. The spectral range of the title is admittedly ambitious, and standards of a more limited range would certainly be welcomed.

RB-2: Diode Array Radiometry, Colorimetry, and Photometry (Priority 2)

This proposal relates to proposal WP-2, Computerized Array Radiometry, of the Fourth CORM Report. Many of the objectives of WP-2 have been met by the NBS in carrying out an initial evaluation of measurement problems associated with array devices. There are still great uncertainties in spectroradiometric measurements made with these devices, and the scope of these problems requires further definition. The Array Radiometry subgroup of CORM is planning an intercomparison to continue this investigation, and the support and advice of the NBS in this undertaking would be beneficial.

* * * * * * * *

MEASUREMENT SCIENCE CONFERENCE

The final meeting of the 1986 Measurement Science Conference Committee was held at Teledyne Systems Company on March 13, 1986. Information from the final reports which may be of interest follows:

1. 458 registered attendees with approximately 90 more attending in the Exhibit Only status.

2. Although all bills are not settled at this date, it appears that there will be approximately $5,000 surplus to add to the reserve.

3. The 1986 Conference was evaluated to be the best MSC ever held. (Had higher ratings in all categories on the evaluation cards.) The following are the percentage of attendees who rated the category listed at Good or Excellent:

a. Overall Conference = 96%
b. Hotel = 93%
c. Food/Service = 97%
d. Registration = 89%
e. Conference Organization = 97%
f. Technical Content = 87%
g. Exhibits = 98%
h. Guest Program = 87%

Other information which may be of interest:

1. Attendee breakdown: 46% were Managers/Supervisors, 26% Engineers, 10% Exhibitors, 1% Teachers, and 10% were of other occupations.

2. Professional society affiliation: 10% ASOC, 20% PMA, 24% NCSL, 13% IEEE, 8% ISA, and 25% Other. (Work is needed in this area to ascertain affiliation of the 25% Other category, and also to clarify multiple affiliations.

3. Number of MSC conferences attended: 47% were first timers, 19% have attended two, 7% have attended three, 11% have attended four, 10% have attended five, and 5% have attended six or more.

4. Comments received were primarily complimentary and/or positive in nature. Examples:

"Best conference I have ever attended"

"The conference was well organized and run"

"I thought this was the best selection of papers yet"  

"Wide aisles helped relieve the congestion so we could talk to people easier"

"A very smooth running conference"

"Excellent, but I would like to see signs above the exhibits instead of in front of them"

"I would like to see the conference schedule mailed prior to the conference so we could select sessions before we arrived," etc.

The few negative comments included:

"Some sessions had insufficient seating"

"How about video taping the sessions?"

"Insufficient free parking"

"Too far from LAX"

"Why don't we have papers on Fiber Optics," etc.
Committee News

We also received a number of volunteers who would like to work on a committee, serve as a session developer, and a number who would like to be speakers at the 1987 conference.

Since I had the privilege of being the 1986 President and Conference Chairman, I am especially pleased to present this most favorable report.

The next Measurement Science Conference will again be held at the Irvine Marriott Hotel, and it is scheduled for January 29 and 30, 1987.

D. A. Brungart, NCSCI/MSC
Liaison Delegate

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NCSCI ITEMS FOR SALE

In response to popular demand, the following items are available from the NCSCI Secretariat, postpaid, at the prices indicated.

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
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<tbody>
<tr>
<td>* Training &amp; Information Directory</td>
<td>$ 10.00</td>
</tr>
<tr>
<td>* NCSCI Directory of Standards Labs (biennial)</td>
<td>25.00</td>
</tr>
<tr>
<td>* Calibration Lab Managers’ Guidebook</td>
<td>5.00</td>
</tr>
<tr>
<td>* NCSCI Newsletter (single copy)</td>
<td>5.00</td>
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<tr>
<td>* One-year Newsletter Subscription</td>
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<tr>
<td>* Duplicate or Replacement Plaques</td>
<td>50.00</td>
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<tr>
<td>* NCSCI Lapel Pins (sterling silver)</td>
<td>15.00</td>
</tr>
<tr>
<td>* NCSCI 2” 3-Ring Binder (information manual)</td>
<td>5.00</td>
</tr>
<tr>
<td>* Tabbed Index Dividers for Binder (set of 6)</td>
<td>1.00</td>
</tr>
<tr>
<td>* Additional Information Manual Fillers</td>
<td>10.00</td>
</tr>
</tbody>
</table>

Delegates of new member companies receive all the asterisk items as part of the new-member information package. Updated material, e.g., Training Information Directory and Directory of Standards Labs are automatically forwarded to all member delegates as they are published. Additional items are available at prices indicated. Mail orders, prepaid in U.S. funds, to the NCSCI Secretariat, National Bureau of Standards, 325 Broadway, Room 5001, Boulder, CO 80303.
TEMPERATURE SYMPOSIUM IN PRC

In the second half of April, 1986, I attended the first International Symposium on Temperature Measurement in Industry and Science held under Chinese auspices in Beijing. There were approximately 40 attendees from Western nations; a disappointing number, representing in some degree budget stringencies in National Laboratories. There were no attendees from the Comecon nations or Taiwan. The Western presence was, however, of very high quality. Attendance included roughly twice that number from China and Japan.

There were some 70 papers, ranging in subject from the thrust to revise the International Practical Temperature Scale to reports of new applications of thermometry to process. More than half of these were by Chinese or Japanese authors. It evidently been recognized that these authors might have difficulty in reading their papers (required to be in English) intelligibly. To address this problem, the organizing committee had the foresight to have all papers available in a hardbound volume at the opening of the meeting, so that the reader could follow the speaker. This permitted accessibility and made for good question periods.

During the meeting, visits were arranged to the Temperature Section of the National Institute of Metrology. The Section is divided traditionally into Cryogenics, the Platinum Resistance Thermometer and Thermo-couple ranges, and radiation thermometry. I was impressed with the Laboratories. Physical plant is adequate although not plush. Equipment tends to be nuts-and-bolts, but of entirely adequate quality; that is, intended specifically to maintain the units of temperature in the simplest and most direct way. The equipment is of Chinese construction, but Western equipment (e.g., Guildline) is well represented. I saw little that was exotic, and at this stage of China's standards development that is probably appropriate.

It seems evident that China has decided that the key to its economic future is export; that the key to export is quality assurance; that at the apex of quality assurance is proliferation throughout industry of a solid supportive basic standards competence. This is a philosophy to which I can subscribe; it has been the philosophy which has directed my own activities for many years.

Of particular pleasure to me was a set of measurements made by NIM on a YSI Gallium Melt Point Apparatus, which they have had for about a year. This device is intended for thermometer calibration at the melting equilibrium of pure gallium, nominally 29.77154°C. The difference between this mean of the Chinese measurements and ours, based on two quite independent realizations of the Temperature Scale, was 130 micro-degrees; a most satisfactory result.

There are approximately 70 scientists and technicians in the Temperature Section at NIM, a very large number compared to any Western National Laboratory. Some of us commented on the Chinese determination to build a solid national standards competence, while our own nations seem bent on systematically demolishing theirs.

In summary, I have a most positive view of the Chinese effort to establish themselves as a nation among nations with a sound and comprehensive basis in the fundamentals of measurement science.

Henry Sostman
Yellow Springs Instrument Company

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NCSL/NBA SPRING MEETING

On March 12th, 1986, the NCSL Executive Committee consisting of Bryan Werner, Ed Nemeroff, and Pete England, together with John Lee, Hartwell Keith, and John Martin, met with Dr. Ernest Ambler, Director of NBS, plus other senior managers from the Bureau. These included George Uriano, Don Johnson, John Lyons, Barry Taylor and Ernest Gardner.

Items discussed:

1. NBS Budget. According to Dr. Ambler, the fiscal 1987 was flat when compared to that of 1986. The cold neutron reactor was being given top priority by the Bureau. (Please note since this meeting there is the possibility this may not happen.)

NBS staff members are going to be visiting large aero-space with the idea in mind of getting industry support for major projects in which industry would share the expense.

2. NBS Organic Act Review. There is nothing new to report at this time.
3. NCSL Measurement Requirements (1982 Version) Survey. NCSL committed to update every five years. NBS would supply a preliminary report updated by the April Board Meeting. In the future NCSL would, on a continual basis, update the National Measurement Requirement Report. In the future we would include additional information concerning marketing information, i.e., how large the potential market was for the service needed (the cost benefits would also be detailed).

4. NCSL Secretariat Update. We advised the Bureau of our progress on establishing our independent secretariat. Questions were put to NCSL regarding relocation of the Secretariat to the Washington DC area.

Other topics discussed included reassignment of the volt, commercialization of NBS developments, etc.

We lunched with many senior individuals from the Bureau, during which we discussed other problems and general topics.

E. Nemeroff
Executive Vice President

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CALL FOR NOMINEES - WOODINGTON AWARD FOR PROFESSIONALISM IN METROLOGY

Purpose

This award, sponsored by the Measurement Science Conference as a memorial to the late Andrew J. Woodington, is the measurement community's recognition of an individual who represents the highest level of professionalism and dedication to the metrology profession.

Background

Andy Woodington's presence as a metrology professional impacted all of us. He served as Chairman of the National Conference of Standards Laboratories (NCSL) before the office was changed to President. He was Director of the Metrology Division (METROD) of the Instrument Society of America. Andy co-chaired the 1972 Joint Measurement Conference at Boulder, Colorado. He participated in San Diego, and the Navy Metrology Engineering Center, Poma. Andy was a person who clearly personified the expression "metrology professional." The Woodington Award was conceived following Andy's untimely death just days before the 1978 Measurement Science Conference.

Qualifications

Nominees for the Woodington Award are to have exhibited noteworthy professional achievement in the metrology field. Nominees are to have warranted national or international recognition and acceptance as metrology professionals who consistently perform and conduct themselves with dedication, competence, and commitment, and also inspire and enhance the professional status of others working in metrology. The areas of achievement and expertise to be demonstrated by the nominees need not be restricted to technical, as managerial and administrative contributions are equally important. All in all, the winner of the Woodington Award must represent the highest level of professionalism and dedication to the metrology community.

Award and Presentation

A $500 honorarium, a certificate, and engraved plaque will be presented during a general session of the January 29-30, 1987 Measurement Science Conference.

Nomination Procedures

Nominations should include nominee's name, business affiliation and address, brief statement of qualifications (supporting documentation may be included), nominator's name, and nominator's business affiliation, address and telephone number. Nominations must be mailed by September 30, 1986 to:

George Uriano
Chairman, 1987 Woodington Award Committee
Room B354, Physics Building
National Bureau of Standards
Gaithersburg, MD 20899
(301) 921-3231

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MEASUREMENT SCIENCE CONFERENCE

Irvine Marriott, January 28 & 30, 1987

What is the MSC?

The first Measurement Science Conference was in 1969. Originally established to promote measurement education and professionalism, the conferences have matured to serve as a continuing source of new technical and management information relating to measurement and quality assurance. Based in California, the MSC has increasingly attracted representatives from all geographic areas of the country.
This conference provides a forum for the exchange of ideas, techniques and innovations of interest to those engaged in the field of measurement, product design and test and in all other fields of metrology. Experts in the measurement sciences are invited to present sessions, workshops, or papers on subjects of concern to the measurement community, including subjects addressing the state-of-the-art.

This is the only national conference of its kind. If you are involved in any area of measurement assurance, product testing and quality control, you should take this opportunity to participate with others in the field. Scientists, engineers, managers and technicians all find the programs stimulating and informative.

Topics Include

- Metrology and Quality Assurance
- Process Control/Measurement Control
- Productivity and Quality
- Propagation of Uncertainties
- International Traceability Developments at NBS
- Automation of Calibration
- Computer Applications in the Laboratory
- Technical Disciplines Including -
  - Electro Mechanical
  - Dimensional/Linear
  - Time and Frequency
  - Optical Electronics
  - Microwave/Millimeter
  - DC/Low Frequency
  - Statistics

Authors

You are invited to participate in MSC'87 by presenting an original paper in one of the topics listed or a related subject. Notify the Program Chairman as soon as possible of your interest together with our name, address, telephone number and a short biographical sketch. A 200 word abstract should be submitted with your reply, if possible, or by June 1, 1986.

Respond To

John Van de Houten
Program Chairman
TRW S/937
One Space Park
Redondo Beach, CA 90278
(213) 535-1497

MCS'87 LOCATES NAVY LABORATORY RESOURCES

The new edition of the Directory of Federal Laboratory & Technology Resources - A Guide to Expertise, Facilities, and Services is now available from the National Technical Information Service. The 1986-1987 directory is a convenient, easy to use, Government-wide reference tool that engineers, scientists, and decision makers can use to locate valuable Navy, as well as other Federal technological resources. More than 900 resources are fully described and arranged under 31 subject headings for quick reference. Each reference provides a detailed description, a contact address, and a telephone number. Also provided are descriptions of 90 federal technical information centers, including all of the DoD information analysis centers (IACs).

For a brochure detailing this new directory, contact the Center for the Utilization of Federal Technology, National Technical Information Service, U.S. Department of Commerce, Room 11R, Springfield, VA 22161; (703) 487-4838. To directly purchase a copy of this publication, reference order number PB86-100013/ABA, and send a check to NTIS for $29 plus $3 for shipping and handling.

ASTM PLANS DEVELOPMENT OF STANDARDS FOR ADVANCED CERAMICS

Participants are sought by ASTM for an organizational meeting to discuss the development of standards for advanced ceramics. The meeting will be held 12-13 August 1986 at ASTM headquarters in Philadelphia.

The need for standards in this area was initially expressed by members of ASTM Committees C-8 on Refractories and C-21 on Ceramic Whitewares and Related Products, and by the National Bureau of Standards and Oak Ridge National Laboratory.

Advanced ceramics are a new generation of high performance materials used for sophisticated high technology, high value added applications. They have unique properties (mechanical, heat/corrosion/wear resistance, optical magnetic) that make them the preferred or only material for diverse applications including heat engines, electronics, cutting tools, and wear parts, biomedical devices, and sensors. However, to date there has been minimal effort devoted to these emerging materials by the standards setting organizations.
Therefore, a planning meeting was held 6 March 1986 at ASTM headquarters that brought together representatives from ASTM committees having a possible interest in this field and key representatives of the advanced ceramics community to explore the need for standards. Proposed areas identified as needing standards include: processing (nonproprietary); characterization; properties; performance (time dependent processes in the use environment); statistical procedures; and terminology. These and other areas will be discussed in detail at the August organizational meeting.

Those interested in attending the meeting or wanting additional information should contact Wendy Dyer, Staff Manager, ASTM Developmental Operations, 1916 Race Street, Philadelphia, Pennsylvania 19103, 215/299-5526.

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GEORGE T. FURUKAWA RECEIVES ASTM AWARD OF MERIT

George T. Furukawa, retired physicist for the National Bureau of Standards in Gaithersburg, Maryland, is a 1986 recipient of ASTM's Award of Merit.

Furukawa, of Evelyn Drive, Rockville, Maryland, received the award at ceremonies hosted by ASTM Committee E-20 on Temperature Measurement, held 14 May 1986 in Philadelphia, Pennsylvania. He was honored for many contributions to the Society in the development of meaningful temperature standards, especially in the field of resistance thermometry, and for this acknowledged technical leadership in the broader field of metrology.

The Award of Merit, and the accompanying honorary title of Fellow of the Society, were established in 1949 to recognize productive service to ASTM, marked leadership, outstanding contribution, or publication of papers.

Furukawa has been an active member of Committee E-20 for 20 years. He was a secretary of Subcommittee E20.03 on Resistance Thermometers for 10 years and a member of Committee E20.07 on the Fundamentals in Thermometry for 10 years. Furukawa is a prolific writer, having published 66 refereed papers, primarily on heat capacity of various projects, on calorimetry, and on resistance thermometry.

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ROLF B. F. SCHUMACHER ELECTED FELLOW OF THE AMERICAN SOCIETY FOR QUALITY CONTROL

Rolf B. F. Schumacher, Senior Metrologist, Rockwell International, has been elected a fellow of the American Society for Quality Control. He will be recognized at the Honors and Awards Luncheon, May 19, during the 40th Annual Quality Congress in Anaheim, California. He will be honored for his outstanding leadership in the development of new techniques and methods for controlling and quantifying measurement uncertainties and for his untiring efforts in the area of calibration system requirements.

As Senior Metrologist in Rockwell's metrology laboratory, Schumacher is responsible for the engineering, quality, and procedural aspects of the calibration control system. During his 20 years with Rockwell International, he was also a supervisor, quality assurance, in charge of metrology operations. He came to Rockwell International from Lockheed Electronics Company in New Jersey where he was laboratory supervisor of the standards and calibration laboratory.

Schumacher has been a member of ASQC since 1970. He has been active in the ASQC standards and metrology technical committees, and is chairman of the ASQC writing group for quality standards for calibration systems and the quality control of measurements. He is also a member of the Institute of Electrical and Electronics Engineers, and the Precision Measurement Association.

The American Society of Quality Control, celebrating its 40th anniversary, is a non-profit professional association comprised of individuals in the quality, reliability, and maintainability fields. Dedicated to the advancement of quality, ASQC for many years has been seeking a national commitment to quality.

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FINLINE DIODE SIX-PORT

"Finline Diode Six-Port: Fundamentals and Design Information" (RN 1090) describes the research and results to date in the development of a circuit for measuring the complex scattering parameters of microwave devices and circuit elements at higher frequencies and lower powers than is currently practical. It indicates that an integrated diode finline six-port with greatly reduced power requirements at frequencies above 18 GHz can probably be constructed. A finline is a thin printed or metal coated substrate inserted parallel to the electric field inside a waveguide. The finline circuit incorporates beam-lead diodes as power detectors. The report may be ordered from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, for $1.75 prepaid; order by stock no. 003-003-02714-6. CONTACT: Collier Smith, 303/497-3198.

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DETERMINING MICROWAVE POWER DELIVERED TO AN ANTENNA

In laboratory settings as well as in the field, it is often desirable, even essential, to know the net power delivered to a microwave horn or other antenna. For example, standard-gain horns are used to establish known electromagnetic fields in anechoic chambers, and uncertainties in knowing the net delivered power cause uncertainties in knowledge of the fields. NBS has developed a procedure for measuring the net delivered power and evaluating its uncertainty. This measurement and computation procedure also can be used to self-calibrate the system by placing terminations of known characteristics, such as shorts or matched loads, on certain ports. The technique is explained in "A Radio-Frequency Power Delivery System: Procedure for Error Analysis and Self-Calibration" (TN 1083), available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, for $1 prepaid. Order by stock no. 003-003-02610-1. CONTACT: Collier Smith, 303/497-3198.

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INTERELEMENT INTERACTIONS IN PHASE ARRAYS

Large phased array antennas can be more efficiently and effectively designed, and their performance more accurately predicted, if we understand the effects of mutual impedances on array element excitations and the role played by multiple reflections and mutual impedances in producing elementary patterns that combine to form the radiated field. The first results of a study of these issues are presented in "Interelement Interactions in Phased Arrays: Theory, Methods of Data Analysis, and Theoretical Simulations" (TN 1091). A principal objective of the study is to determine if it will be possible to predict the far-field pattern of a large phased array from measurements of some of its subarrays in the near field. Since many large arrays are too big or immobile to be economically measured using present techniques, the study is intended to solve a major measurement problem. Copies may be purchased for $2 prepaid from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402; order by stock no. 003-003-02715-4. CONTACT: Collier Smith, 303/497-3198.

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SENSOR DEVELOPED TO IMPROVE QUALITY CONTROL OF PROCESSED METALS

A new Ultrasonic sensor for measuring the depth and properties of treated steels and metal alloys has been developed at NBS to improve quality control of processed metals. The sensor, which uses ultrasonic waves to make very precise measurements of both the depth and mechanical properties of surface-modified layers, eliminates the need to destroy finished products by cross-sectioning materials to determine the effectiveness of processes used to modify metal surfaces and the quality of the component. The sensor was developed by two guest workers, from Johns Hopkins University, Dr. Moshe Rosen, Professor of Materials Science, and graduate student Bret J. Elkind, and NBS scientist Dr. Haydn N.G. Wadley. The sensor has been evaluated in a series of laboratory tests at NBS to verify its accuracy and performance. The researchers anticipate the new ultrasonic sensor will become an important measurement tool for manufacturers using nondestructive evaluation techniques to improve the quality control of their products. CONTACT: Roger Rosenberger, 301/921-3181.

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COMMENTS REQUESTED ON ELECTRICAL AND SAFETY TESTING SERVICES

NBS and the General Services Administration (GSA) are seeking comments on the need to establish a National Voluntary Laboratory Accreditation Program (NVLAP) to accredit
laboratories that perform electrical and safety testing services. The program has been requested by GSA, which annually purchase millions of dollars worth of electrical and other equipment that must be tested using recognized standards including Underwriters Laboratories (UL), the National Fire Protection Association (NFPA), and the American National Standards Institute (ANSI). GSA believes a NVLAP program will expand the number of qualified independent laboratories and make testing services more convenient to contractors. The increased competition for testing services is expected to ultimately lower government costs, GSA says. Comments on the proposed program should be sent by May 12, 1986, to Bob Bearden, GSA/FSS, Item Management Division (FCM), Crystal Mall Building 4, Room 709, Washington, DC 20406, with copies sent to NBS. For information on the program, contact: Harvey W. Berger, Manager, Laboratory Accreditation, A531 Administration Building, National Bureau of Standards, Gaithersburg, MD 20899, telephone: 301/921-3431. CONTACT: Roger Rensberger, 301/921-3181.

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OPTICAL FIBER MEASUREMENT SYMPOSIUM AT NBS

The Fourth Symposium on Optical Fiber Measurements will be held at NBS Laboratories in Boulder, Colorado, September 9-10, 1986. Cosponsored by the IEEE Optical Communications Committee and the Optical Society of America, the symposium will cover measurements on fibers, related active and passive components such as switches and connectors, and systems. About three-fourths of the session will consist of contributed and invited papers, and the rest will be devoted to workshops led by invited panelists. Deadline for submission of papers is May 23; more information may be obtained by writing Douglas L. Franzen, Div. 724.02, National Bureau of Standards, 325 Broadway, Boulder, Colorado 80303. CONTACT: Collier Smith, 303/497-3198.

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VIDEO/FILM FEATURES NBS CHEMICAL ENGINEERING ACTIVITIES

The National Bureau of Standards (NBS) Center for Chemical Engineering has produced a 19-minute videotape/film program describing the center's activities in support of the chemical and related industries.

The production highlights opportunities for private sector involvement, which includes the loan of industry scientists and engineers to work with the center on projects of mutual interest; calibration of customers' instruments; and laboratory and plant measurements as well as direct funding of NBS research projects. It explains how NBS provides industry with reliable measurement techniques and references data needed by engineers to design, develop, and control chemical processes. This information is used by the chemical and allied industries—including petrochemicals, paper, pharmaceuticals, and others—to improve efficiency and assure equitable trade in feedstocks, fuels, and commodities.

"Chemical Engineering: Measurements for a Competitive Age," may be ordered from Video Transfer, Inc., 5710 Arundel Avenue, Rockville, MD 20852, 301/881-0270. Prices (purchase orders or checks are acceptable) including shipping, are $20 for VHS-SP or BETA II videotape; $24 for 3/4-inch videotape; and $175 for 16-mm color film. Foreign (PAL and SECAM) formats also are available. For more information, contact Ron Meining, A903 Administration Building, National Bureau of Standards, Gaithersburg, MD 20899, telephone: 301/921-3112.

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STATE-OF-THE-ART MASS CALIBRATIONS FOR STATE LABORATORIES

The Center for Basic Standards and the Office of Weights and Measures have completed a major phase in a project to improve the accuracy and efficiency of state mass calibrations. A package is being shipped to several state weights and measures and industrial laboratories consisting of: (1) kilogram masses of various geometries and densities; (2) fractional mass standards for determining mass differences at various altitudes; (3) computer hardware and software for standardized data reduction and statistical control; and (4) air density instrumentation, i.e., temperature, barometric pressure, and relative humidity. Participating laboratories are state laboratories of California, Colorado, Nevada, New York, Utah, and Hawaii and laboratories at Sandia and the 3M Corp. For further information contact Randall Schoonover, B160 Physics Building, National Bureau of Standards, Gaithersburg, MD 20899, (301) 921-3520.

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REPORT TO OMB ON VOLUNTARY STANDARDS CIRCULAR

The Secretary of Commerce transmitted a report to the Office of Management and Budget (OMB) on the implementation by Federal agencies of OMB Circular A-119,
"Federal Participation in the Development and Use of Voluntary Standards." The report, which is required to be submitted every three years, summarizes the implementation efforts of 13 cabinet-level departments and 9 independent agencies involved in voluntary standards activities. It indicates that the circular has had a positive effect on use of voluntary standards in several Federal procurement and regulatory programs and that agency participation in voluntary standards activities has been enhanced by the circular. The report also provides tables showing Federal use of voluntary standards in regulatory and procurement programs and the extent of Federal agency participation in voluntary standards activities. The report was prepared by the Office of Product Standards Policy utilizing information submitted by the agency representatives to the Interagency Committee on Standards Policy, chaired by Stanley Warshaw. For additional information contact: Donald Mackay, Office of Product Standards Policy, A625 Administration, National Bureau of Standards, Gaithersburg, MD 20899, (301) 921-3287.

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NEW FILM/VIDEOTAPE DETAILS CURRENT NBS AUTOMATION RESEARCH

NBS has released a new audio-visual production describing current work on industrial automation at the Bureau's Automated Manufacturing Research Facility (ARMF). The Bureau's pioneering work in "data-driven" control techniques for manufacturing process and in accuracy enhancement are emphasized. The 22-minute production entitled "The ARMF, June 1985" is available from Video Transfer, Inc., 8710 Arundel Court, Rockville, MD 20852, telephone: (301) 881-0270. VHS or Beta format tapes cost $13, 3/4-inch U-Matic costs $20, and 16-mm film costs $90.

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NBS REPORT SURVEYS WORLDWIDE OPTOELECTRONICS INFLUENCE

Japan is currently ahead in the worldwide race to commercialize the optoelectronic products that constitute major components of fiber-optic and other information-handling systems. However, the United States, through its superior science base, can catch up if industry and government programs concentrate on transferring products to the market quicker. This is the conclusion of a new NBS report that projects the impacts of optoelectronics technology on the economy between now and the turn of the century. (Worldwide research and development in this technology is projected to reach $1 billion annually by 1987). Produced by NBS senior economist Gregory Tassey, the study also estimates that the Federal government's contribution to optoelectronics measurement technology--the so-called infra-technology--could save the economy $100 million to $200 million by the year 2000. Tassey cites other studies that suggest industry will likely underinvest in measurement despite the critical importance of such technology in boosting U.S. competitiveness in marketing optoelectronics. The Bureau study urges a strong liaison between NBS and industry to bolster this crucial optical measurement technology. For a copy of the report, "Technology and Economic Assessment of Optoelectronics," send a self-addressed mailing label to Dr. Gregory C. Tassey, A1002 Administration Building, National Bureau of Standards, Gaithersburg, MD 20899.

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BIBLIOGRAPHY OF NBS ELECTROMAGNETIC TECHNOLOGY DIVISION

The NBS Electromagnetic Technology Division performs research in the areas of cryoelectronics, electromagnetics, lasers, microwaves, optical fibers, superconducting materials, and time domain metrology. The division develops measurement methods and standards and provides metrological support for laser systems, optical electrical engineering materials. "Metrology for Electromagnetic Technology: A Bibliography of NBS Publications" (NBSIR 85-3029) lists the publications of this division from January 1970 through December 1984 in all media, including journals, conference proceedings, texts, and NBS publications. The publication is available from the National Technical Information Service, Springfield, VA 22161, for $1.95 prepaid. Order by PB 861-130234.

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THEORY OF MEASUREMENT OF LASER PULSE ELECTRIC FIELD

NBS has begun to develop a system to measure the time and spatial features of the electric field of a laser pulse with at least 1% accuracy. The principal features of the system include use of a computer-generated spatial filter to convert the laser beam into a form suitable for fiber-optic processing; an optical fiber located at each selected measurement point in the filtered beam; these fibers contain a "pinched" section to eliminate all but the fundamental modes; and a detector to measure the power from each fiber. The theoretical basis for the methodology and instrumentation is described in "Direct Measurement of the Electric Field of a Laser Pulse--Theory" (TN 1084), available from the Superintendent...
The administration's request for $10 million in fiscal year 1987 for a "cold neutron" facility for advanced materials research is a bargain compared with what Western Europe and Japan are paying for similar facilities, NBS' Lyle Schwartz told the House Subcommittee on Science, Research and Technology recently. Schwartz, Director of the NBS Institute for Materials Science and Engineering, urged approval of the funding "in a competitive world in which standing still guarantees falling behind." Without such a facility, Schwartz said, "our nation will be left far behind our main industrial competitors in access to essential cold neutron measurement technology." The United States can develop a major cold neutron facility at a modest cost, Schwartz said, in part because a 20-megawatt research reactor located at NBS in Gaithersburg, MD, already has provisions for a cold neutron source. The FY 1987 budget request would allow NBS to begin building a facility that would ultimately include 15 experimental stations to exploit the existing source. At least four of the stations would be financed by private industry and universities working as participating research teams. CONTACT: Michael Baum, 301/921-3181.

U.S. NEEDS MEASUREMENT ADVANCES TO COMPETE IN FIBER OPTICS

Improved measurement technology will play an important role in the ability of U.S. fiber optic businesses to compete with countries such as Japan, an NBS official told the House Subcommittee on Science, Research and Technology recently. In testimony on the proposed fiscal year 1987 NBS budget, John W. Lyons, Director of the NBS National Engineering Laboratory, described difficulties in measuring characteristics of optical fibers and components. "Despite the sophistication of individual firms in the business," Lyons said, "there are very substantial difficulties in making the measurements to characterize the components of the system both for buying and selling them and for evaluating them in place." The Bureau's work in fiber optics measurements began about 10 years ago. Now, a decade later, with fiber optic technology more sophisticated, the need for reliable measurements is more pronounced, Lyons said. NBS seeks a $950,000 FY 1987 budget increase for fiber optic measurement research and services. Another $750,000 will be transferred from existing research areas at NBS, for a total of $1.7 million for the fiber optics program. CONTACT: John Henkel, 301/921-3181.
WELCOME TO OUR NEW NCSL MEMBERS

Electricity Division, NBS
Building 220, Room B258
Gaithersburg, MD 20899
Delegate:
Dr. Barry N. Taylor
(301) 921-2701

Raytheon Service Co.
5740 East Bayside Road
Virginia Beach, VA 23455
Delegate:
Travis E. Belcher
(804) 444-1324, 460-2241

Honeywell/Test Instruments Division/Phoenix
2626 West Beryl Avenue
Phoenix, AZ 85021
Delegate:
Judith H. Brandstadter
(602) 861-4571, 861-4544

Barber-Colman Company
1354 Clifford Avenue
Loves Park, IL 61111-2940
Delegate:
Larry Erickson

Conax Florida Corporation
2801 75th Street North
St. Petersburg, FL 33710
Delegate:
Jim Van Metre
(813) 345-8000, ext. 248

NBS, CRRL
Building 245, Room C229
Gaithersburg, MD 20899
Delegate:
Wayne A. Cassatt
(301) 921-2551

Mercuriser Stern Drives and Inboards
3003 N. Perkins Road
Stillwater, OK 74074
Delegate:
William E. Tackett
(405) 377-1200, ext. 316

General Electric Company
Battery Dept.
P.O. Box 114
Gainesville, FL 32602
Delegate:
Ramesh V. Shah
(904) 462-3549

Tellabs Texas, Inc.
601 Jeffrey Way
Round Rock, TX 78664
Delegate:
Rob Hernlund
(512) 255-1156

New York Power Authority
IP-3, P.O. Box 215
Buchanan, NY 10511
Delegate:
Ron La Vera
(914) 739-8200, ext. 285

3M, Traffic Control
Materials Division
3M Center, Building 582
St. Paul, MN 55144
Delegate:
Don Waldbillig
(612) 733-2621

I bet it would take me only about 10 minutes to find the extra money.

How much is a Boeing 747 full of people worth? It is $125 million plus 400 people. It seems ludicrous to me that microwave standards supporting a global positioning system that can place you anywhere on earth within ±30 feet and would have kept Korean Air Lines Flight 007 in its air lane and aloft, are being compromised by meager budgets.

Does anyone else want to join us in getting our national microwave priorities communicated? ■

Disclaimer
This somewhat irreverent external view of NBS obviously comes from a measurement background, from which I have observed the national scene. The views expressed are strictly my own responsibility and are specifically not to be connected with my employer, Hewlett-Packard, or the National Conference of Standards Laboratories.

References
May 14, 1986
Kollman Institute
Merrimack, NH
Harry Haymes
Region 1 Coordinator

Harry has assumed the Region 1 helm due to Bill Robinson’s stepping down. Bill’s recent promotion at Raytheon necessitated his vacating the Coordinator’s position. “Congratulations,” Bill, and best of luck in your new challenge. Many thanks for your past efforts. Harry explained why he is now the “new/old” regional coordinator and is no longer the Director of Regions 1 and 2. Due to economic reasons at Sanders, he had to resign. Hopefully, if things improve, Harry will again run for the NCSL Board of Directors. As Harry has held the Coordinator’s position for many years, he asked for volunteers to fill this position. He feels that any person with fresh ideas, a progressive outlook and the welfare of NCSL and Region #1 in mind, should come forth. Anyone interested should call Harry at (603) 885-4913.

Ed Nemeroff, NCSL Executive Vice President, was expected to present the Board of Directors report, but due to pressing business, he couldn’t attend. Harry filled the group in on some past happenings.

The meeting’s theme was Electro-Static Discharge (ESD). The first guest speaker was E. Scott Carpenter of Semtronics, who gave an informative presentation on the ESD topic. Scott touched on the history of ESD, the problems it causes, methods to control it, implementation, and return on investment. He presented a Faraday Cage Shield demonstration with the popular pink-poly bags and the laminated-metal bags that was very interesting. Scott also reflected on his past experiences while implementing a corporate-wide ESD Program for the Data General Corporation. Total company involvement was stressed by Scott. Return on investment was analyzed in terms of first pass yields in a manufacturing environment. The numbers were very impressive. Many of the situations Scott discussed were vivid and home-hitting because the ESD Program is finding its way into our calibration laboratories. Scott fielded many questions from the members. The presentation ended on a positive note: “Promote ESD Control Compliance – "THE TIME IS NOW.”

Our second guest speaker, John Kennedy of Teradyne, Inc., explained his company’s direction relating to ESD and their implementation plan. John discussed the different phases that his company passed through to achieve their goal of ESD Control. Upper management involvement is a definite requirement for the ESD Program according to John. A point that was also stressed by Scott. John highlighted the requirements of the static control process which included: Work station set-up, work surface ground cards, grounded equipment, ground strategy, cost estimates, and personnel grounding; the elimination of unnecessary static generators such as plastics and tape. John stressed not only worker training, but also worker involvement. A humidity level of 45 to 55% is the ideal environment for minimizing the effects of ESD. John compiled a list of test equipment that would enhance any ESD Program:

- Meg-ohm meter
- Surface/volume resistivity probes
- Humidity chamber
- Static decay meter
- Static field meter
- Charge-plate with oscilloscope
- ESD simulators
- Nanocoulomb meter with Faraday cup

Return on investment was also consideration at Teradyne. Their first pass yield went from 62% to 90% after ESD control was implemented. John ended his presentation by fielding questions from the group.

Harry informed the attendees on several problem areas that may affect us all in the near future. These areas are:

- MIL-STD-45662 - Calibration: Another change might be on the way.
- MIL-STD-9858 - Quality Systems (Software): Computer programs that we utilize in ATE calibration will now be under this standard. Harry noted that this change will be addressed by the Board of Directors.
- DOD-STD-2003 - Magnifier for solder connections. The 4X and 10X magnifiers will now fall under this standard.
- Monitoring Soldering Irons - Checked daily for 20 ohms or less to ground and for proper temperature.

The meeting was opened for general discussion. Points brought up were:

- The next meeting will be scheduled after the 1986 Conference to provide feedback to members who were unable to attend.
- Check ESD mats. How?
- Hazardous wastes: Mercury
- Theme of next meeting will be software and/or out-of-tolerance conditions.

A thank you is directed to the following:

E. SCOTT CARPENTER
For handling a difficult subject in such an interesting presentation.

JOHN KENNEDY
For an interesting and informative presentation of what is being done at his company to eliminate ESD problems.

LARRY POTARO
For arranging John Kennedy's attendance at our meeting.

RICHARD J. LOZOSKI of LTX
For these minutes. I really appreciate the help.

A very special and appreciative thank you for Verne Mundell and all of his associates at Kollmann Instrument Company for the use of the company's facilities and making our meeting very enjoyable.

ATTENDEES

Herb Barclay
Gary Bishop
Ralph Bustin
Ken Butler
Norm Carbonneau
Scott Carpenter
Bill Conary
Joe Dooley
Tim Driver
Bill Foley
Phil Goinan
H.B. Haymes
Carl Jackson
J. Kennedy
Richard Lazoiski
Ted Majewski
Paul Migliaccio

V. Mundel
Lynn Murphy
Charles Mazzey
R. Olsen
Jim Parsons
Richard Perry
Dick Pietrowski
Larry Potaro
Bob Russell
Bob Sheehan
Hank Snowman
Milt Towne
William M. Wilson

Teradyne, Inc.
Kollmann
Raytheon Company
G.E.O.S.D.
M/A-Com
Semtronics
Analog Devices
Raytheon
ITT
Raytheon
Kollmann
Sanders Associates
Northrop
Teradyne, Inc.
LTX Corporation
Avco Syst/Textron
GTE Government Sys.
Kollmann
Kollmann
P&W Aircraft UTC
Digital
Digital
Sanders Associates
Teradyne, Inc.
Kollmann
Kollmann
Fairchild
Sanders Associates
Avco Syst/Textron

The meeting opened by Arthur R. Vogt, began with the technical presentations. Our host was Doug Smith of Abbott Laboratories.

Ted Held of Abbott Laboratories gave a presentation on an automated temperature measuring system developed by Abbott. The system is comprised of a platinum resistance thermometer (PRT), programmable digital multimeter, personal computer and an Abbott developed computer program. For accuracy enhancement, a precision resistor is also utilized. This system's intended usage is as a secondary temperature calibration standard. When used within a typical environment, the system's accuracy is within ±0.02°C over the range of -70°C to +400°C. In use the system accurately measures and displays temperatures directly in engineering units, thus eliminating the need for "look-up" tables and/or interpolation.

Joe McIntyre discussed IIT Research Institute's automated saturated standard cell measurement system. Joe touched on the history of this measurement system indicating that in the early 1970s 42 measurements would be taken manually and those results used to create tables. This compares with the present automated system where the computer takes 1960 measurements and it requires the user to be there for only one half hour. These measurements are used for the intercomparison results, which can then be printed out. IIT has been able to compare volt transfers to within 0.1μV over a three year period.

Barry Lloyd of John Fluke Inc. presented Les Huntley's speech "Process Metrology and the Automated Factory". Les Huntley is the metrology manager at John Fluke Inc. The issues brought up included throughput, product mix, and product quality. The main point stressed in regards to these issues is that performance is assessed by measuring product, but the product can best be controlled by controlling the process. The process needs to be in control at desired setpoints, and it needs to be stable. Several good ideas came out of the speech and copies were made available to those who were interested.
Regional Reports

A discussion of the latest NCSL happenings was initiated by Ralph Bertermann and Dave Duff. These included: the proposal to reorganize the region; a new RP on laboratory design will be available at the October conference; the conference will be October 6-9 in Gaithersburg, MD; two new committees have been formed, Equipment Management and Safety committee. The group discussed these and other topics of interest under an open format.

Doug Smith talked about a 2-3 day workshop to be held to discuss the needs of the food and pharmaceutical area not being met by NBS and how this could be changed. Those interested in participating or having ideas should send their names to Doug at Abbott Laboratories.

It was decided that the next meeting will be in November, 1986. It will be hosted by Ralph Bertermann of G.D. Searle. The topics to be presented are:

- Equipment Management - Ralph Bertermann, G. D. Searle
- Pressure/Vacuum - MKS
- NCSL: History and Association to NBS - Videotape
- Validating Calibration Processes - William Fitzgerald, Baxter Travenol Laboratories

It was decided that future speakers should have a written speech that can then be available to those in the region who are interested.

The meeting concluded with a tour of the Metrology Department at Abbott Laboratories. Questions were encouraged and answered by the engineers and technicians, which made the tour much more meaningful.

I would like to thank Sandra Timler for taking these minutes.

ATTENDEES:

Ralph Bertermann  G.D. Searle  G.D. Searle
Lauren Bodenstab  Honeywell  Honeywell
Sandy Breault  3M Co. Metrology Lab  3M Co. Metrology Lab
Peter Britt  Hughes Optical Products  Hughes Optical Products
Rick Calkins  Rice Cake Bearing  Rice Cake Bearing
Vincent J. Dire  The Nutra Sweet Co.  The Nutra Sweet Co.
Dave Duff  Eli Lilly & Co.  Eli Lilly & Co.
William Fitzgerald  Baxter Travenol Labs  Baxter Travenol Labs
Frank L. Froege  Delta Technical Products Company  Delta Technical Products Company

Ted M. Held  Abbott Laboratories  Beckman Instruments
Jack Heremann  G.D. Searle  G.D. Searle
Darrell Klein  Raeco, Inc.  Raeco, Inc.
Ron Kleinschmidt  John Fluke  John Fluke
Barry Lloyd  The Nutra Sweet Co.  The Nutra Sweet Co.
Frank Luckenback  IIT Research Institute  IIT Research Institute
Joseph McIntyre  Sunstrand Aviation  Sunstrand Aviation
Jerry McKenzie  American Critical Care Certification Council  American Critical Care Certification Council
David Pacchini  Commonwealth Edison  Commonwealth Edison
Don Ruelmann  Abbott Laboratories  Abbott Laboratories
Doug Smith  Abbott Laboratories  Abbott Laboratories
Sandra L. Timler  IIT Research Institute  IIT Research Institute
Art Vogt  Commonwealth Edison  Commonwealth Edison
D.H. Walters  Delta Technical Products  Delta Technical Products
Jim Woynerowski  

May 7, 1986

Bailey Controls Company
Wickliffe, OH
Mike Maxwell
Region 5, Northern
Ohio/Michigan Section Coordinator

The meeting was hosted by Bill Hinkel and his member company, Bailey Controls Company, Wickliffe, Ohio.

Kate Webster opened the meeting by reading the last meeting minutes and opening the floor for discussion of old business. A brief discussion of equipment management (use, documentation, recall) followed.

Al Peabody of John Fluke Mfg. Co. Inc. then gave a presentation on system uncertainty. His talk was well researched, relevant and of value to all attendees. His presentation covered the following major topics:

a. Specification definition from a user and producer standpoint

b. Definition of uncertainties, their summation and confidence levels

c. Some commonly overlooked design errors which significantly reduce MTBF

d. The right ingredients (administrative and personnel) required for a good metrology lab

e. Theory of error

f. Engineering the total system

g. Error budget and cost optimization.

John Rogers of Heath/Zenith then gave a presentation on the start-up of a calibration lab. His presentation covered:
a. Goals and objectives
b. Calibration in-house/subcontract
c. Environment relative to type of calibration performed.
d. MIL-STD 45662 requirements
e. Methodology used during start-up
f. Automation
g. Standards and their manufacturer selection
h. Database versus hard copy documentation.

The afternoon session was conducted by Dave Duff and covered three subjects:

a. Next Meeting Date and Topics: The next meeting is tentatively scheduled for May 1987, in Livonia, MI. Potential subjects and presenters are as follows:

1) Equip/database mgmt. - Frank Della Torre
2) MIL STD 45662 - Joe Katchoch
3) Precision Temp Measurement
4) Bar coding - Gloria Madrazo
5) Fluke state of the art - Al Peabody

MAPS

b. MAPS: A general discussion led to the consensus that areas of interest are temperature, voltage and resistance. However, starting a MAP in one of these areas requires an artifact and pivot lab. A decision was made to start with resistance. Dave Duff will investigate the possibility of having a local representative of a manufacturer of resistance standards act as the source for the artifact and be the pivot lab. If this approach is fruitless John Rogers of Heath/Zenith will entertain the idea of his company becoming the pivot lab with all participants contributing towards the purchase of desired artifacts. Initial interest is at the 1 ohm and 10 K ohm values.

c. Visibility: Dave presented his thoughts on why and how we can increase the visibility of our metrology function within company. The benefits of this effort are suggested to be greater management support and less difficulty in obtaining required capital to perform the measurements required at the uncertainties desired.

The meeting ended with a tour of the Bailey Controls Qualification Test Lab where environmental, RFI, EMI, seismic, vibration and functional testing are performed on electrical, pneumatic and mechanical products.

ATTENDEES

Neal Sangree
Tom Smith
Gloria Madrazo
Anne Zucker
Dave Duff
Kate Webster
Frank Della Torre
Chuck Cousino
Al Peabody
Bill Hinkel
Joe Katchoch
Jim Crane
John Shipley
John Rogers
Joe Montella

Babcock & Wilcox ARC
Volkswagen of America
Sohio
Eli Lilly
The Bioptics Corp.
NASA
Toledo Edison
John Fluke Mfg. Co. Inc.
Bailey Controls Company
Gould, Inc., R.S.D.
Keithley Instruments
Technicare
Heath/Zenith

April 21, 1986
Eli Lilly and Company
Indianapolis, IN
Dave Duff
Region 5 Coordinator

There were eighteen present at an experimental one-half day meeting called for the express purpose of answering this question: "Is there sufficient interest to establish Indianapolis as a sectional meeting location for NCSL?"
Regional Reports

Bob Hipple, Manager of Plant Engineering Services, welcomed the group of thirteen companies. Once we had each introduced ourselves and shared background information, we viewed the NCSL slide presentation and discussed in detail the benefits of belonging to NCSL. We also discussed the regionally developed listing of topics, which is a good summary of national measurement issues.

After a tour of the Lilly metrology lab and the Corporate Visitor Center, we reconvened to discuss the possibilities of an Indianapolis section. As an indication of the affirmative response, Pete Boykin volunteered to host a fall meeting and Loren Puck, Jack Lockhart and Rick Noone volunteered to be on the program. (There were 14 additional companies unable to attend this meeting that requested additional information and asked to be included on our mailing list which now stands at 40.)

As a "show of interest and faith," it is my recommendation that we work to increase the present Indiana membership in NCSL from 7 to 20 by the June Board meeting.

ATTENDEES:

Mary Ann Beam
Fredrick Begley
Peter W. Boykin
Don Cummings
Mary Ann Pulmer
Jay L. Gregson
Tony Heath
Bob Hipple
Jack Lockhart
Rick Noone
Loren Puck
Jon Rich
Charlie Ruman
Steve Strong
Dr. Edmund Taylor
Bruce Tliebert
Leslie Winslow
Delco Electronics
Naval Avionics Center
State Weights & Measures
Endress & Hauser
Eli Lilly and Company
Waters Associates
Naval Avionics Center
Fluke
Eli Lilly and Company
Tech Sales and Serv.
Waters Associates
Endress & Hauser
Pluke
Claud S. Gordon Co.
Naval Avionics Center
Mallory Components
Quaker Oats
EIL Instruments

* * * * * * * * * * * *

April 10, 1986
Barrios Technology
Houston, TX
Randy Wear
Region 6, Houston Section Coordinator

The first Houston meeting was attended by 14 people. The attendance was divided as follows: 3 instrument manufacturers; 2 oil industry; 5 aerospace contractors; 2 commercial calibration labs; 1 public utilities. The meeting began with the introduction of Enyre Robinson, President of Barrios Technology, who welcomed the new NCSL Houston Section.

Bill Simmons, NCSL Region 6 Director, began the meeting by having the attendees introduce themselves, their title and the company represented. Bill then introduced himself and Randy Wear of John Fluke Manufacturing Company. Randy will be the Houston Region Section Leader.

Bill Simmons gave a slide presentation, "What is NCSL?" and discussed the NCSL structure, purpose and management. A discussion of Guidelines for Calibration Managers was given by Bill Simmons. Bill also provided copies of the Calibration Managers Guidebook.

The film "Why Calibrate?" was shown.

A round table discussion format was agreed upon by the group. This format was used to discuss how Houston Section meetings should be structured. The group agreed upon the open forum approach to discuss topics of interest and solve problems. The group agreed guest speakers should be invited to cover topics of interest and provide information addressing problem areas which cannot be addressed by the group.

A brainstorming session was set in motion to generate inputs on subjects, methods, etc., that section members would like as topics of discussion to be addressed in future section meetings. Discussion topics to be covered are as follows:

State of the Art of Measurement Equipment:

a. In industry
b. NBS (What is NBS doing?)
c. Where should it be
d. Frequency measurement and frequency standards

Discussion of Standards and Procedures:

a. Working standards
b. Transfer standards...(Ken Crow, HL & P will address)
c. Procedure writing
d. Mil Spec 2000
e. MIL-STD-45662
f. Automation of standards
g. Recall

h. Perception of standards
   EX: PAA; 45662; 2000
   (How do different industries perceive specs/requirements)

i. The need for manufacturers to update
   their manuals (procedures)

General Topics of Interest:

a. How to merge computer science with
   metrology

b. How to get quality personnel
   - Qualification (how to determine)
   - Training (what is available)
   - Motivation

c. Laboratory credibility

d. Verification vs. calibration

e. Communication between NCSEL sections and
   regions
   - Interchange of information
   - Problem solving
   - Information regarding problems
     related to a specific industry

f. Quality circles...(Wannie McPeters
   - Barrios Technology will address)

g. Automating equipment; parts and
   materials management

ATTENDEES

Dwayne Ortman
Joan Wingo
Ron Smith
Phil Valentin
Kent Crow

Ken Kolb
Don Francis
Randy Wear
Robert Benner
Dave Sanders
Robert Karafa
Wannie McPeters
Mike Halbert
Bill Simmons

Schlumberger
Barrios Technology
Barrios Technology
Texas Instruments
Houston Lighting &
Power
Ruska Instruments
Ruska Instruments
John Pluke Mfg. Co.
Meters and Instruments
Oscilloscope Services
Schlumberger
Barrios Technology
Barrios Technology
Barrios Technology

The fourth scheduled meeting of the section was attended by 35 people of which 21 were from test equipment user organizations, 11 from the manufacturers, and 3 from service companies.

The usual roundtable informal, but structured format was follows: scheduled discussion topics covered in the morning and afternoon with our special feature speaker in the mid/late afternoon.

Mark your calendar now for the next meeting to be Wednesday, November 12, 1986 (9:00 a.m. to 4:00 p.m.) at the Tektronix Facilities in Las Colinas (adjacent to DFW Airport). Please spread the word to your associates and friends that everyone involved with measurements and test equipment is invited. Test equipment manufacturer representatives are encouraged to continue to distribute the NCSEL brochures and invite your customers to attend and participate. The words "standards laboratories" has scared some people off and wrongfully so. Anyone involved with measurement and user's of measurement tools (test equipment) can benefit. Measurement quality and credibility begins with communications, so please start now.

The leaders of the Region 8 San Diego Section, Dick and Glenda Ringard, attended our meeting and actively participated. Dick graciously favored us with an interesting contrast and observation of our meetings and others he has attended. We received a very encouraging report. I can't remember if he had won the attendee door prize (HP business calculator) before or after his remarks? Seriously, we welcome visitors from other sections, regions, and the NCSEL Board and committee chairman/members.

The Open Forum and Test Equipment Manufacturers Announcement period of the meeting was minimal this time. In contrast, it was very active last time. I suggest that this segment of the meeting could be one of the most fruitful for all and everyone should at least come prepared for it.

Discussion topics covered at this meeting as follows: (Contact Discussion Leader if additional information or discussion is desired)
A. NCSL: Survey and Region Boundary Proposed Changes, RP\#3 Draft Revision

The results of the 1985 NCSL benefits survey were summarized for the Region 6 area by Bill Simmons; the details of which are contained in the April 1986 Newsletter (Vol. 26, No. 1). Bill also led discussion on the proposal for region boundary changes and associated subjects. Little discussion was forthcoming and one could construe that the existing organization was not creating any problems for those present, so why change. My interpretation is that those attending section/region meetings fairly regularly and the national meetings are relatively happy. The possible benefits from the proposed changes as related to the present organization, doesn't necessarily create more sections and activity for those not familiar or bashful of the "Standards Laboratory" club.

The initiative to revise NCSL RP\#3 on calibration documentation format and contents has been proceeding. With some help from key people, the first draft was distributed in March in preparation for the IEEE workshop in Gaithersburg and AIA meeting in Seattle. Feedback from that limited distribution is almost complete as of this writing. Plan is to have our final draft ready for distribution to NCSL Board of Directors Meeting 3 weeks prior to the BOD meeting on July 9, 1986.

B. Training

This meeting's training subject introduced us to a relatively new medium to most, that being the interactive video disc. Jim Berry of Texas A&M University, substituting for Dr. Bill Grubbs, described the medium, different levels of interaction, production costs, copy costs, playback hardware costs, etc., based on his experience in a study done for local industry. Apparently, 3M in Minneapolis is the principle marketer at present. Conclusion: Potentially very soon available and more effective training tool than the video tape because of the ability of interaction and random access to material dependent on the trainee's progress. A local video store will provide a demo at the next meeting. Jim Berry/Dr. Bill Grubbs, Texas A&M University, (409) 845-6767/6762.

C. National Bureau of Standards (NBS) Support and Service Experiences

A fairly active but basically negative discussion developed from the standpoint of NBS being the supplier of measurement services and most of the rest of NCSL, their customers. It appeared that few were aware of the NBS SP250 document and especially the major changes to take the place in it. Some that used 250 complained that they never were made aware of changes in services available. Two organizations present indicated that they were now obtaining services from NRC-Canada with much better turnaround time with no perceived quality problems. Another indicated that they were going to ETL-Japan for services. Even another organization commented that some of their international customers were typically taking "pot-shots" at our NBS. A general thought or question evolved as to whether organizations went to the "right person" at NBS for help; is there a mechanism in place to even know, etc. The discussion ends with the question in most peoples' minds...how does NBS assess whether they're effective, they're performance, their technical capability etc. Conclusion: We need to talk and discuss directly with an NBS representative rather than second guessing, etc. See next meeting agenda. - Art Meakin/Brannin McNeil, E-Systems, (214) 272-0515, ext. 4758.

D. Test Equipment Acquisition and Obsolescence Practices

A review of one organization's criteria and recommended generic practices on the subject was covered. Conclusion: Real world practices don't reflect preferred criteria, and practices vary considerably dependent on organizations' concerns with measurement technology, integrity, and control. - Bill Simmons, Barrios, (713) 483-2971.

E. Electrostatic Discharge (ESD)

A continuation of previous meeting session at ESD with the same high level of interest and discussion. Four handouts were provided by Jim Scrivner: (1) HP's summary of Factory and Field Experiences, (2) List of electrostatic discharge references, (3) Article from April 1986, Electronic Test Magazine (page 63), "Finding Static Control Solutions," and (4) a vu-cell outline on Electrostatic Discharge Control. Jim also referenced a periodical provided by 3M as a good current awareness bulletin. It can be obtained free from 3M, P.O. Box 2963, Austin, TX 78769, (512) 834-3200, by requesting their Static Digest.

Conclusion: ESD is a very real problem, partly understood and somewhat of a sleeping disaster. The prevention materials, control, or common sense practices are being used by some, but to be effective, must be monitored, especially the periodic preventative maintenance aspect of materials. There seems to be much information (papers, studies, video, etc.) around for
reference. The recognition that pink-poly-bags are not a static shield is being realized and some viable and inexpensive test devices are becoming available. A 3M representative from the area that will be invited to the next meeting to answer questions and provide information. - Jim Scrivner, Hewlett Packard, (214) 231-6101.

F. Communications, How Can We Improve?

A very rousing and humorous general session was provided with the aid of an audio cassette of an old, but still applicable "Who's on First" radio dialog between Abbott and Costello. Mike reminded us all of the non-communicable and sometimes obvious and not so obvious things we all do to miscommunicate, along with a very good example. Mike did an artful job to set the stage for our guest speaker. Conclusion: If any element of industry suffers from communications problems, it's the measurement and test equipment people. Acronyma and multi-defined terminology abounds. We need help to establish some credibility. - Mike Rajohns, Tektronix, (214) 699-8161.

SPOTLIGHT GUEST SPEAKER

Our special guest speaker was Mr. Fred Hume, Vice President of Technology and Planning at John Fluke Mfg. Co., Inc., Everett, Washington. Fred's talk theme was the "Changing Role for Calibration and Standards Laboratories." A copy of his presentation is attached. Communications, or otherwise the true exchange and understanding of performance or requirement test specifications as well as test method expertise is where the "metrologist" can most benefit his organization in categories of quality, throughput, efficiency, etc.

CONCLUSION

The person or organization with measurement awareness is sorely needed, but not in the traditional role of the past 25 years.

For the DPW Section, we thank Fred Hume for taking time to visit us and appreciate his talk and discussion.

FINALE

A special thanks to Marshall Kay, Jim Scrivner, and Hewlett Packard for hosting the meeting. The facility, arrangement, and luncheon were terrific.

Another thank you to the discussion leaders and the active participants. Everyone's contributions are what makes it click.

ATTENDEES

James E. Rider
Ron Groom
Cathy Lowes
Clyde Ostron
Andy Bradshaw
Luke Smith
David B. Schneider
Donald E. Eddy
Bill Simmons
Cliff Swellings
Art Meakin
Paul Trimbach
Dennis Gipson
Paul Pederson
Earl Murphy
Terry Mitchell
Ed Green
Craig S. Leong
Ralph Tillery
Bob Pfister
Fred Hume
Jim Berry
Bob Willett
Ken Horne
Joe Brown
Johnnie L. Winters
John Roemer
Dick Ringard
Jim Smisek
Jim Scrivner
Max Maxim
J. W. Walker, Jr.
Glenda Ringard
Harvey Evans
Don Francis

Texas Power & Light
AT&T, Oklahoma
AT&T, Oklahoma
Texas Instruments, Dallas
Rockwell Int., CTSD
E-System, Greenville
Lockheed Austin Div.
Rockwell Int., Collins Avionics
Barrios Technology
Texas Instruments
E-Systems
Multi-Amp
AT&T, Shreveport, LA
MCI
General Dynamics
Motorola
Tucker Electronics
Tucker Electronics
Tellabs Texas
John Fluke Mfg. Co.
John Fluke Mfg. Co.
EIP/TEEX Texas A&M University
Rockwell Int., CTSD
KS Specialists
Data Marketing Associates, Inc.
Fluke
John Fluke Mfg.
Ringard Metrology
Testech, Inc.
Hewlett Packard
Hewlett Packard
Wandel & Goltermann
Ringard Metrology
Scientific Devices
Ruska

TTTT

CHANGING ROLES FOR CALIBRATION AND STANDARDS LABORATORIES

Presented to:

National Conference of Standards Laboratories

Dallas, Texas
April 16, 1986

By Fred Hume
John Fluke Manufacturing Co.

INTRODUCTION

The relationship between Metrology and the economic vitality of a manufacturing company
is not well understood. If this relationship were better understood, Metrology would become an element of corporate strategy for most producers of industrial goods. The adoption of sound metrological principles in manufacturing can be directly related to gains in productivity and effectiveness.

The Japanese have demonstrated that efficient and effective production is the key to gaining market share and global position. Two forces in manufacturing have been proven to operate synergistically to magnify the efficiency of production. These forces are QUALITY IMPROVEMENT and COST REDUCTION. Application of Metrology to production processes is a cost-effective means for maximizing both these forces.

International competition has driven many U.S. firms to adopt principles of production from abroad. Just-In-Time inventory control, and Statistical Process Control are two of many production concepts now adopted in the U.S. by many firms. The measurements community within the U.S. is facing challenges related to the change in production philosophy. These challenges include assessment of environmental effects on process parameters, measurement standards for process control, and creating a new, active, role for calibration and standards laboratories.

DEFINITION OF A METROLOGIST

The measurements community referred to above, consist of a pyramid of individuals. At the top, there are individuals who are employed in the primary measurements laboratory within the United States. That is the National Measurements Laboratory contained within the National Bureau of Standards, part of the Department of Commerce. At this level there are not more than a few hundred individuals. The next lower level in the pyramid consists of individuals in calibration and standards laboratories maintained principally by major U.S. corporations and the government. At this level, there are several thousand individuals. Individuals within these two levels who have appropriate education and technical skills, are identified generally as Metrologists. These individuals are highly skilled in one or more of many specialized fields of measurement.

Below these two levels are tens, or hundreds, or thousands of individuals who perform technical (physical or electrical) measurement in their daily work, but whose objective is not the measurement itself. They are interested in achieving some result and, for them, measurement is a means to an end. Many of these are employed in research, design, or production. In most cases they would be more productive and effective if they had access to the advice and counsel of Metrologists, as related to the measurements they perform.

A Metrologist is someone who knows how to perform relevant measurements. He can determine what measurement is relevant, he knows how the measurements should be performed, and he knows when sufficient measurements have been performed to obtain a result within the limits of uncertainty allowed.

MEASUREMENTS IN A PRODUCTION ENVIRONMENT

The accuracy and precision of instruments manufactured by the John Fluke Manufacturing Co., Inc., has allowed them to be used extensively for the performance verification of electronic products of all types. In addition to their application in calibration and standards laboratories, they are used in test departments, evaluation laboratories, engineering laboratories, and receiving inspection departments of most electronic manufacturing companies. In the verification process they are used to determine how closely products (or other instruments) conform to the limits of performance assigned.

There is an obvious trend today toward using these instruments to measure the performance of a manufacturing process, rather than to verify performance of a product. This change from product measurement to process measurement will have a major impact on Metrologists, who are accustomed to the former, and in many cases, work in laboratories which periodically recall instrumentation used in production to the laboratory to verify calibration, or at most, calibrate some production instruments in-situ. There is a great need for further development of theory and practice for Process Metrology.¹

The Japanese have focused their production efforts on reducing the number of product failures (improving reliability). Unfortunately, they have not been as diligent in reducing the cost of failure, as anyone who has experienced a failure in a complex electronics product manufactured in Japan has discovered. Their holistic view of quality (many Japanese engineers have difficulty articulating the difference between the terms quality, reliability, and accuracy) makes it difficult for them to conceptualize the value of modularity and performance specifications for sub-system elements in a complex electronics system. Obviously, their approach has merit, but I believe that what

is needed is a melding of the two concepts. Even the most reliable electronic systems appear to fail at the most crucial moment, so the ability to return to normal operation in a short time is critical to the user. Metrologists can play an important part in this melding of reliability and service-ability to deliver products which maximize the benefit/cost ratio of owning them.

The third major trend in production measurements that affects the Metrologist is the linking of design and production through Computer Aided Engineering (CAE), Computer Aided Design (CAD), Computer Aided Manufacturing (CAM), Computer Aided Test (CAT), etc. These product development tools allow the production and test processes to be defined much earlier in the product development cycle. Process engineers, methods engineers, manufacturing engineers, and test engineers are collaborating with design engineering to define test equipment and methods are playing a greater role in the specification of production test equipment. Metrologists have yet to inject themselves into this process to the extent desirable.

Within a manufacturing company there are many links between major functions, some of which are becoming electronic, but some are not. There are links between engineering and production, engineering and purchasing, engineering and marketing; there are links between production and purchasing, production and marketing, and most importantly there are the all-important links between the customer and production and marketing. What is common to these links is a specification. Many of these specifications relate to physical or electrical performance of devices or products. Metrology, as a keeper of information about the measurement of performance to specifications, should serve as a consultant or technical expert to ensure that the specifications are relevant and that the appropriate measurements of performance can be made.

**CHANGES IN THE DESIGN ENVIRONMENT**

I have already referred to the impact of CAE on the linkage between engineering and production. Other significant trends are also influencing the role of measurements in a design environment. The increasing complexity of modern electronic systems is in evidence all around us. State-of-the-art designs are requiring new test methods, and design verification is becoming increasingly difficult and time consuming. Electronic links between CAE and CAT to provide for automatic test program generation, has proven to be more elusive than most vendors are willing to admit. While still a promise for the future, it is clear that at some point the software algorithms must be validated, the software code verified, and the automatic test hardware calibrated in a dynamic mode.

Success in Japan2 in overlapping new product development phases portends further changes in the interface between design and production. Adoption of this approach, while offering many advantages, will prevent the clean verification of performance of a new product at the completion of each phase since there will be significant overlap between the phases.

**NEW ROLES FOR CALIBRATION AND STANDARD LABORATORIES**

These organizations must now reassess their mission if they are to provide the maximum benefit to their parent organization. This redefinition of business starts with a statement of who their "customers" are. While most laboratories have viewed their customers as the owners and users of test equipment within their company, it is now clear that they have another major customer group to serve, that is senior management, particularly if they are to satisfy the strategic competitive goals of the company.

The second element in the redefinition of business is to define the needs of the expanded customer group in real terms. Clearly these needs are changing rapidly as can be seen from what has been said above. Laboratories which attempt to serve the same needs as in the past will find themselves unnecessary or irrelevant in the future.

How the laboratory will satisfy these new needs is the third and perhaps most important element of the redefinition. Calibration and Standards organizations must learn how to apply their skills to production to increase efficiency and effectiveness. Perhaps it is time to drop the term "Laboratory" from the title of the NCSL, since the term seems to connote isolation that the production environment. Such isolation is the antithesis of the Metrology of the future.

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April 24, 1986
Motorola Gov't Electronics
Phoenix, AZ
Lee J. Walters
Region 8, Phoenix/Tucson
Section Coordinator

The NCSL Board of Directors had just completed a quarterly meeting in Philadelphia and it was believed that a representative from that group had not been able to make the overnight trip to Phoenix. Rolf touched upon recent developments in the NCSL including progress on our separation from the NBS. We are aware that one of our major tasks will be to act as a voice for industry to those who are responsible for funding the NBS and who influence areas that funding will support. NCSL is no longer sponsored by the NBS but the Bureau does have representation on the NCSL Board of Directors.

NCSL is planning its long range goals this year and the floor was opened for discussion as to what those goals might include. Two suggestions from the floor were as follows:

1. Add more definition of the capabilities of laboratories listed in the NCSL Directory.
2. Provide better tools to use in selling management on the needs of the metrologist.

At this point, John Lee, past NCSL President, acknowledged that he had just arrived from a chilly Philadelphia to share highlights from the NCSL Board meeting. John is currently chairman of the NCSL Government Affairs Committee.

The Government Affairs Committee recently testified before Congress that the NBS has been given many new responsibilities and little additional funding.

John also related that MIL-STD-45662 is apparently being re-written again and drafts should be available late in 1986 or early '87 for review and comment.

NCSL will soon release a document with recommendations on how a standards laboratory should be built.

John also asked for comments on the NCSL Newsletter (several copies were available at the meeting). The Newsletter seems well received and no significant comments were noted.

A question from the floor asked what efforts were being made by NCSL to provide worldwide acceptance of domestic measurements. John indicated that many countries are providing some metrology services which are better than those obtained nationally. Laboratory accreditation is one answer to being recognized at an international level. Foreign entities do recognize formal accreditation programs and this matter is currently being addressed by the NCSL.

Peter Stein noted shortcomings in some measurement areas within the NBS. One of these areas is transducer characterization. Peter suggested that NCSL offer more constructive criticism to NBS and Congress. John indicated that this is currently being done but that Peter should document his ideas and submit them to NCSL for inclusion in future efforts (Pete has already submitted his written thoughts which are attached to these minutes).

A thought was expressed from the floor about the possibility of the NCSL gathering data on the total dollar volume of sales its member organizations represent with respect to
the dollars allotted by Congress to the NBS to support these organizations.

A request from the floor asked that NCSL use its influence to push for the standardization of specifications used by equipment manufacturers. John suggested that the solution to this problem would be a difficult one but that NCSL is addressing it. It was also suggested that the Newsletter might be used to highlight some specifics regarding verification of certain specifications used by equipment manufacturers.

Rolf asked for comments regarding the issue of the reorganization of NCSL sections and none were received.

After a break period, Tom McGovney (TRW Operations & Support Group) was introduced to bring the section up-to-date on bar code activities at TRW. Bar coding is used to track test equipment inventory. Tom is a systems analyst and is based in the Equipment Control Department. This Department owns all the general purpose test equipment and "rents" it to TRW users from a test equipment pool. The system uses the 3 of 9 code and was chosen from a list of 12 because it's alpha-numeric and also because the U.S. Government uses it. TRW uses high density labels which are also used as asset tags. A laser scanner is used because it's more efficient and the reading accuracy rate is extremely high.

TRW tracks over 70,000 pieces of equipment of which 60,000 are bar coded. The Management Information Systems department controls the mainframe computer used to process all data. Bin areas within the pool are bar coded to denote the "IN/OUT" status and location. All other areas in the plant will eventually be bar coded for even more accurate tracking of equipment locations. TRW's system records over 200,000 moves per year which represent over half the moves made during that time period. Tracking errors were 5% before bar coding was implemented and have since dropped to zero (one error is suspected in over 300,000 readings). This is felt to be the major factor in favor of the bar code system.

Their future plans include covering spare parts and transfers of test equipment from one floor location to another. Most "to/from" pool issues are transacted using the bar code system.

There have been deterioration problems with labels stored in sunlight but otherwise label quality is high. TRW's property section handles some of the test equipment labeling. There have been no problems with the acceptance of the barcoding system by government inspectors.

Tom had a laser bar code reader and many sample labels on hand to demonstrate the speed and efficiency of the bar coding system. The presentation was very interesting and informative. Not least of all was the time savings offered to the user of such a system.

Time remained before lunch to begin covering the issue of surveying vendor laboratories. Rolf Schumacher conducted the discussion which was an area of high interest to those in attendance. MIL-STD-45662 states that "The contractor is responsible for assuring that the subcontractor's calibration system conforms to this standard to the degree necessary to assure compliance with contractual requirements" (para 5.10). Compliance with this paragraph of the MIL-STD might be interpreted a number of ways. The purpose of the session was to gain consensus about what should be done to demonstrate compliance with this requirement. This is an area where cost of compliance can be significant or minimal depending upon the interpretation. Distance, turnaround times and documentation are also important considerations.

It was noted that a government inspector would not consider a simple phone call to a potential subcontractor as adequate to qualify him as being in compliance with the requirements.

After lunch, the discussion was resumed and key points were outlined to aid in choosing a calibration vendor. The first concern is who can do the job? When a potential choice is made then an auditor can be sent to survey such things as technical performance, procedures, description of the system and if it complies with the applicable provisions of the MIL-STD. An interesting comment made was that the vendor should conform to the requirements of your own standards to the degree necessary to perform the required service. Some think an auditor looking over a facility is sufficient but its up to you to determine what's adequate in choosing the subcontractor (you'll have to defend the choice if asked to do so).

Other points to determine include the calibration of the vendor's own equipment; is it calibrated periodically and is the interval selected adequate to serve your application. The vendor's out of tolerance feedback should include information discovered later if his own standards are found to be out of tolerance. Defining what out of tolerance conditions are significant is an important point to address in the documentation. A mix of Q.A. and metrology auditors would be a balanced approach to doing a complete survey. Other MIL documents such as MIL-Q-9858 and their requirements might be addressed too. It appeared that the consensus gained at this meeting.
Regional Reports

was that first hand visits to a vendor laboratory are certainly an acceptable way to qualify his facility. A disinterested third party located within the same geographical area as the potential vendor might be used in a qualification exercise as well.

Rolf looks for sufficient procedural documentation when a deviation from nominal occurs (documentation of corrective actions to be taken, etc.). Acceptance requirements become much more analytical when the finer points are addressed in the documentation. NCSL "Recommended Practice #2" is suggested as a first step in establishing a calibration control system. (Ken Armstrong of NBS should be able to supply this document or direct you to the source.) Other survey experiences were exchanged among those present.

An open forum discussion followed. Conducted by Rolf, the theme of this period seemed to ask, "What's your problem?". Ken Pierce asked what others are doing about electrostatic discharge (ESD) problems and should the test equipment laboratories be responsible for implementing preventative measures and to police the implementation of ESD procedures at other facilities. The consensus seemed to suggest that this would be a Q.A. function and that implementation of company procedures should be borne by each department within the company and policed by the Q.A. group. It was indicated that MIL-STD-286 addresses this issue.

Will Orr asked if any problems have surfaced with regard to the calibration of torque wrenches in the 0-100 in-oz area. Another participant answered that linearity appears to be a problem and should be closely watched.

A question of whether or not ESD around DRT's was a problem and the consensus was that it certainly could be.

Rolf asked what would be desirable for discussion at future meetings. The topics should, as a rule, be interesting to all attendees. Jim Berg recommended a discussion on the control of calibration software, an area we all have to address either now or sometime in the future. Connie Davis suggested the possibility of an anonymous salary survey broken down by cal technicians, cal engineers and size of company.

The meeting was adjourned.

There were 58 persons in attendance which is the most ever to attend a Phoenix/Tucson section meeting. Some problems were noted but considering the unprecedented numbers all went relatively well. Early reservations, prepayment and follow through by the attendees was greatly appreciated and helped make the meeting a success. Tucson representatives have expressed a desire to hold the October meeting there and will be contacted to consider the arrangements.

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SUMMARY OF THE DISCUSSION COMMENTS

Offered By Pete Stein
Stein Engineering Services, Inc.
Phoenix, Arizona
at the
NCSL REGION 8 - PHOENIX/TUCSON SECTION MEETING
April 24, 1986

Since NCSL is now independent of NBS, not only can we support NBS with Congress more effectively, but we can also offer constructive criticism to NBS on a sounder basis. One of these constructive criticisms certainly must be the cancellation in the 1970's and the continued neglect of just about all programs relating to transducer characterization which used to be carried out in the Mechanics and Electronics Technology Divisions (which now have different names) under Simpson and French.

We have, at present, no or very limited capabilities in dynamic force calibration, dynamic pressure calibration beyond limited pressure and frequency ranges, and accelerometer calibration, beyond limited amplitude and frequency ranges. The excellent programs of the 70's under Roscoe Bloss and Paul Lederer (now deceased and retired respectively) need to be revived and carried forward with vigor. Not only does our industry and Defense Department need these capabilities, but other countries are making rapid strides in these areas.

The personal antipathy of the NBS Director against such research has harmed our capabilities and, I believe, strong urging to resume our position in these fields would be well placed. As member for 6 years of 3 National Academy of Sciences Panels at NBS I witnessed the demise of these programs in spite of much industry support.

Intimately connected activities in transducer characterization include much-needed work on the transient-temperature sensitivity of pressure transducers, accelerometers and load cells—work which had an excellent history at NBS before it was discontinued in favor of putting the self-same scientists on projects such as the energy-efficiency of washing machines and the stability of bicycles.

It is suggested that the discretion which the NBS Director has in allotting funds be
re-directed to the areas mentioned above, and that NCSL may lend a strong hand in achieving that goal. It is often thought that transducers are thoroughly understood and have been well characterized—nothing could be further from the truth! Not only in the mid '70s but in the mid '80s as well.

Is there anything wrong with working in a nice environment?

Poolside Lunch, Holiday Inn, Scottsdale. Pretty cushy, this metrology business, eh?

ATTENDEES

James L. Abramson Honeywell Large Computer Products Division
Allen L. Allshouse Motorola Government Electronics Groups
Wayne E. Benda Hughes Aircraft
Jim Berg Sperry Flight Systems
Dennis M. Bishop Precision Measurement Group
Ken Boyle Honeywell Test Instrument Division
J. H. Brandstatter Tierney Turbines
Chris J. Castonguay Consultant (ASCM, Retired)
Harold C. Chrispen Temp-Cal Enterprises
Bud Crisel Litton Systems, Electro Devices Division
Constance V. Davis Motorola Discrete & Special Technology Group
Claude A. DeGracia Garrett Turbine
Donald S. Erb Goodyear Aerospace

Donald H. Fisher Motorola Government Electronics Group
Betty J. Forbes Motorola Discrete & Special Technology Group
M. S. Franckowiak Precision Measurement Group
Jean W. Gardner Motorola Discrete & Special Technology Group
John B. Green Arizona Electronic Standard Laboratories
James L. Grewe Micro-Rel
Richard M. Hanley Motorola Discrete & Special Technology Group
Bill L. Heer Motorola Government Electronics Group
James Hines State of Arizona, Weights & Measures
Richard P. Horn Motorola Government Electronics Group
Bill Hutchinson UniDynamics Defense Systems
Ken Jackson Motorola Government Electronics Group
Al Klock Motorola Discrete & Special Technology Group
Edward J. Kress W.L. Gore & Associates, Flagstaff
Al Lauria Digital Equipment Corp.
John J. Lee Telogy, Inc., San Carlos, California
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Bruce W. McIntosh Sperry CSD, Salt Lake City, Utah
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Kenneth W. Pierce Motorola Government Electronics Group
Jim Puch Motorola Government Electronics Group
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Richard O. Ringard Ringard Metrology, San Diego, California
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Thomas E. Severin Rogers Corporation
William C. Shepard AiResearch Electronics Systems Division
Miles L. Smith Motorola Government Electronics Group
Don Stahl Honeywell Large Computer Products Division
Regional Reports

Peter K. Stein
Stein Engineering Services, Inc.

Samuel R. Stucy
Digital Equipment Corp.

Judy A. Vallejos
W.L. Gore & Associates, Flagstaff

Lee J. Walters
Motorola Government Electronics Group

Ted L. Wilson
Unidynamics Defense Systems

* * * * * * * * *

May 7, 1986
Proud Bird Restaurant
Los Angeles, CA
Robert Smith
Region 8, Los Angeles
Section Coordinator

Bob Smith, Ford Aerospace and Communications Corp., LA Section Coordinator, following announcements and attendee introductions, distributed a sheet with program topic ideas (attached). If not already completed, it is requested that one be completed and returned as indicated.

Mr. Dennis Pinnecker of Rockwell International led the discussion of Feedback to NBS. Technical concerns in various disciplines, uncertainty reporting, NBS Reports, NBS Seminars, Artifact Shipping, Software, SRMs, and good NBS support were all topics presented. A written summary has been sent to NBS. Copies may be obtained by contacting Bob Smith.

Dr. Joe Simmons of NBS, gave the NBS response and report based on the Feedback session from last year. Written handouts were provided along with an update of NBS Response to NCSL National Measurement Requirement Survey. Additional copies may be obtained by contacting Bob Smith.

Mr. Dennis Paunce of Ford Aerospace and Communications Corp. led the general discussion, "I Have A Problem - What's Your Solution?" A variety of topics were discussed such as: (1) detailed failure reporting of MTE repairs; (2) monitoring environmental conditions; (3) organizational relationships of the Metrology Lab to other groups in the company.

Following lunch and the group picture, Mr. Pete England, General Dynamics, Pomona, gave the report from the Board of Directors Meeting. Pete also showed a new video tape being produced by the Hutchinson Area Vocational Technical Institute that tells the NCSL story. The tape should be available later this year following some minor cleanup work. Attendees were favorably impressed.

Pete then led a discussion regarding NCSL's future mission and objectives. The material used in a Board of Directors brainstorm session was used as the basis for this discussion. A suggestion was made that the mission statement be changed to: "Promote Excellence in Measurements Through Leadership in the Field of Metrology." It was basically felt that the material from the Board of Directors' October 10, 1985, meeting was comprehensive.

Virgil Rogers and Jack Porsch, CAL-LABS, performed the registration duties.

NCSL SECTION MEETING IDEAS

Topics Presented Over the Past 5 Years:

* Software Control In The Lab
* Waste & Toxic Concerns In Metrology
* Auditing Suppliers Of Calibration Services
* Application Of Statistics In Metrology
* Measurement Assurance Of The Factory
* The Legal Volt And Ohm
* Significant Out-of-Tolerance
* Feedback Reporting Of Out-of-Tolerances
* Moving Metrology To The Manufacturing Floor
* Colleges With Metrology Training
* Problems Of The Small Lab
* Bar Coding
* Calibration Intervals
* Automatic Calibration Systems
* NBS Budgets
* New Interpretations Of MIL-STD-45662
* Measuring Metrology Productivity
* Laboratory Accreditation
* Advocacy Position—Should NCSL Take It
* Education & Training in the Lab
* Education & Training in the Lab
* ANSI Standards
* The Metric System—Does It Impact The Lab
* California Measurement Systems
* Government Affairs
Other Topic Ideas:

* Equipment Management - TE Pools
* Test Equipment Acquisition/Obsolescence
* ESD In Metrology
* Are Co-parametric Measurement Requirements Documented And If So, How?
* Are Critical TE Parameters Identified and Handled Differently Than Others?
* Is TE Not Calibrated Distinguished From TE That Is?
* TE Manufacturers Performance Specs - Are They Clear And Unambiguous?
* Is There A Plan To Standardize Specs?
* Is Co Built TE Documented Adequately?
* Accuracy Ratio/Guard Bands
* Statistical Knowledge Of The Manufacturing Process And What It Can Do For Metrology
* Video Metrology Training - Is It Any Good?
* Local Round Robins - What Are The Results?
* GIDEP: What Is It/Can It Do Me Any Good?
* Evaluating TE Prior To Purchase
* Metrology Contribution To Co Performance: An Asset Or A Milestone?
* TE User Feedback To Mfg. Is It Important?
* NCSL Interface With Other Organizations
* Poor TE Performers - Local Survey
* Measuring Cal Interval Effectiveness
* Should a Professional Metrologist Fix It?
* Future Trends In TE
* Is The PC An Effective TE Controller?
* Communicating With Other Departments
* Legal Implications Of Measurements/Safety
* Audits - How Do I Get Ready?
* Building A New Lab
* Or....?
Regional Reports

F. Schneider
R. Schumacher
J. Simmons
R. Smith
B. Snyder
L. Steffy
S. Sottfel
S. Stolarz
J. Stork
A. Van Couvering
R. Wagner
R. Wangerin
G. Watson
P. Yates

Northrup - ASD
Rockwell
NBS
Ford Aerospace
Hughes Fullerton
Scope Tek
Loral EOS
Allied Bendix
Temperature Standards
Lab
Hughes
McDonnell Douglas
ESRS
TRW
Shafer Engineering

April 29, 1986
Sperry Corporation
St. Paul, MN
Sandy Breault
Region 5, Twin Cities
Section Coordinator

We started out the meeting discussing our goals and formats for future meetings. It was decided to send out a questionnaire and each member could, in effect, vote on the number of meetings to be held each year, when the meetings should be held, meeting formats, etc.

We discussed the Josephson Junction for a brief period of time and I believe there is much confusion in many of our minds as to the direction NBS will take in resolving 2e/h and h/e². A conference on Precision Electromagnetic Measurement will be held at Gaithersburg during the last week in June. This conference will cover these subjects in depth. I plan to be there and the information gathered will be made available to all members, either through the mail or at one or our meetings.

Since there were no volunteers to host the next meeting, it will probably be held at the Holiday Inn in Maplewood. We get a free meeting room if we eat our noon meal there. Further details will be forthcoming.

If indeed we do end up at the Holiday Inn, there will be more time for speakers and discussions. At this point, we have at least four people who have volunteered their time:

Rick Calkins, Rice Lake Bearing - Mid MAPS
Larry Warner, John Fluke - Volt MAP
Dick Weber, 3M Company - G.I.D.E.P.
Gary Furman, Honeywell - Lab Design

Georgia Harris of The Minnesota Department of Weights and Measures gave a very informative presentation on control charts and statistical analysis.

Herb O'Neil and Rod Brownlee discussed the HAVTI curriculum--where they are and possible future expansion into dimensional measurements.

Rick Calkins has volunteered to give a 1-day training session on load cells and Larry Warner has a training sessions which covers M.P. troubleshooting. We should go into these ideas more in depth at our next meeting.

At this point, I would like to thank all of you for a fine turnout and a special thanks to John Buck and his co-workers, as they were excellent hosts. Thanks also to Georgia Harris, Herb O'Neil and Rod Brownlee.

It is with deep regret that I must mention that Carl Nelson, 3M's Corporate Dimensional Metrologist, passed away suddenly on the 23rd of May. He will be missed by his co-workers and I am sure, by all of those who knew him.

ATTENDEES

Gregg Anderson
Rich Barnes
Sandy Breault
John Buck
Douglas A. Burch
Rick Calkins
Tim Callander
John E. Campbell
Marc Casavant
Michael Czech
Henry Dmbiczak
Dave Duff
Bill Freischel
Gary Furman
Glenn Haigh
Georgia Harris
Urban Hartman
Allan Isacs
Walt Kendall
David Lanning
Gary Lindon
Carl Nelson
Herb O'Neil
Jim Platz
David Reding
Pamela Scalzo
R. A. Scalzo
James Schepers
Tom Smith
Sam Solverson
Dale Stier
Harold Topel

Rosemount, Inc.
Rosemount, Inc.
3M Company
Sperry
Medtronic, Inc.
Rice Lake Bearing
Wm. K. Nelson Company
Waters
Waters
FMC-Northern Ordnance
3M Company
Eli Lilly & Company
Precision Cosmet
Honeywell
Sperry
Minnesota Weights & Measures
Rosemount, Inc.
Sperry
The Trane Company
Medtronic, Inc.
Lee Data Corporation
3M Company
Hutchinson Area Votech
The Trane Company
Sperry
Thomas Scale Supply
Thomas Scale Supply
Sperry
Quality Technologies
The Trane Company
Precision Cosmet
The Trane Company
Larry D. Warner
Richard Weber
Steven Wold
Edward Zalusky
Daryl Zimmerman

John Fluke Mfg. Co.
3M Company
Medtronic, Inc.
3M Company
John Fluke Mfg. Co.

19 students from the Hutchinson Votech School also attended the meeting.

* * * * * * *

March 3, 1986
Watkins-Johnson
Palo Alto, CA
Ashley Harkness
Region 7 Coordinator

The meeting was opened by Ashley Harkness, Jr., Region Coordinator, who welcomed the assembled delegates and guests and thanked Watkins-Johnson for graciously allowing NCSL to use their meeting facilities.

The meeting agenda included two guest speakers: Mr. Breedlove of MIMIR Instruments, and Mr. Agy of the Fluke Calibration Products Development Division.

Mr. Breedlove spoke to the topic of "Measurement of Light." He began with a background overview of particle and wave theory, setting the stage to introduce the parameters of a light sensor. Comparing such sensors to other electromagnetic detection devices, he discussed bandpass absorption filters, orders of transmission, half power points in a bandpass spectrum, and the concepts of a dielectric metalized filter.

At this point, Mr. Breedlove went into some of the problems involved with calibrating light sensors. We learned about the "Heisenberg uncertainty" where reflections in the ultra-violet and infrared ranges from the human skin could adversely affect sensor calibrations. He discussed the various standards in use at present (different lamps and black body sources) and pointed out some of their advantages and problems. Also, we discussed the current services available from NBS.

Mr. Breedlove's talk concluded with a question and answer period.

Our next speaker was Mr. Agy from Fluke Calibration Products Development Division. He spoke to the topic of "New developments in AC metrology."

Mr. Agy gave us a background of RMS converter techniques. We heard about the need for a converter due to the distortion in an AC wave. We reviewed the developed technologies of single and multiple junction thermal converters discussing the problems of thermal shift, low impedance, and poor frequency response.

With that background, Mr. Agy discussed the improvements brought about by an RMS converter base on solid-state technology. The construction incorporates a balanced sensor fabricated on a semiconductor substrate. Thin film resistors are etched on the sensor and laser trimmed. There is no DC reversal and the frequency response extends beyond present day devices. Mr. Agy foresees the time when such a sensor will be used to improve RMS measurements.

Jim Ingram, Region Director, brought the delegates up-to-date on recent NCSL events. We learned that Mr. John Lee was to become the Chairman of the Government Affairs Committee. Ken Armstrong had moved into the NCSL offices in Boulder, Colorado. The draft of the upcoming "Recommended Practices for Laboratory Design" has been sent to the Board of Directors. This RP deals with concerns in the design of laboratory facilities. A tour of the Watkins-Johnson laboratory facilities was taken and the meeting was adjourned.

* * * * * * *
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