NCSL PRESIDENT'S MESSAGE

Mr. Executive:

Today, more than ever before, you are required to achieve high quality, as well as outstanding performance of your products...and at lower costs. Fortunately, over the last decade, a number of management systems have evolved to help your management attain the desired quality levels while maintaining or reducing costs and improving delivery schedules. The control of measurement tools and equipment has been one of the most important of these management systems.

The performance and high quality of your products today wouldn't have been possible without a corresponding rapid growth in your capability to measure accurately and consistently. Your metrologists in your standards and calibration labs have done an excellent job in keeping pace with this technological growth. They have kept abreast of technological advances and have supplied your engineering and manufacturing personnel with the proper standards and calibration equipment consistent with their measurement needs. They have done their best to keep your measuring and test equipment at the desired accuracy levels. In your organization, they may also be responsible for equipment distribution and utilization...Good! A cost effective distribution system goes a long way toward achieving maximum use of your capital investment. They may also be involved in the acquisition and disposal of test equipment. Their knowledge of such points as...equipment measurement capabilities, ease of use, ease of calibration and maintenance, availability of parts and reliability is invaluable in making proper acquisition decisions. Their knowledge of the maintenance and repair costs is also invaluable in achieving timely cost saving disposal of equipment.

But it shouldn't end there. These "measurement oriented" personnel represent an untapped resource if they aren't already participating in other elements of the product life cycle. Your project management, at every level, must carefully plan for measurement tasks associated with specifications, drawings, contract requirements, tooling, test and measuring equipment, training, etc. in all phases of the product life cycle to assure that quality is built into and maintained in your products. Your metrology specialists should be participating in these "measurement oriented" decisions, even at the stage of requests for proposals. They can help your engineers answer such planning questions as...What parameters must be measured?...What tolerance?...How should we measure?...What type of equipment do we need?...Can our present equipment do the job?...When should we measure and test during production?...Is suitable calibration equipment available?...Measurement standards?...Procedures? Their participation during the early phases of product development can help you achieve the most optimum measurement system consistent with your desired product quality and reliability levels.

Ralph J. Curran
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**Mike Suraci**

Lockheed Electronics Co., Inc.

**Board of Reviewers**

R. J. Barra  
D. J. Greb  
M. T. Angelo  
R. Y. Bailey  
J. D. Mitchell  
C. Boyer, Jr.

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**NCSL Newsletter**

**Editor**

**Mailing Address**

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National Bureau of Standards - 200.01  
Washington, D.C. 20234

The NCSL Newsletter is published quarterly in Houston, Texas by the National Conference of Standards Laboratories. It is sent to NCSL-Member Organizations and to a special listing of activities and key personnel whose work is closely related to that of NCSL. Non-NCSL-member subscriptions are available for $10 per year. Extra copies of an issue may be obtained at $2.50 each. Remittance should be made directly to the NCSL Secretariat.
MINUTES
BOARD OF DIRECTORS MEETING
NATIONAL CONFERENCE OF STANDARDS LABORATORIES
25 & 26 JANUARY 1973 - GENERAL DYNAMICS/CONVAIR
San Diego, California

ATTENDEES:

President: Ralph J. Barra (Westinghouse Electric Corporation)

Executive Vice President: Don J. Greb (Lockheed Missiles & Space Company)

Vice Presidents: Mort Angelo (Lockheed-California Company)
    Ray Y. Bailey (U.S. Air Force)
    Carl Boyer, Jr. (Honeywell Inc.)
    J. Dave Mitchell (Autonetics Division, Rockwell Intl.)

Secretary: James A. Valentino (Sanders Associates)

Treasurer: Paul H. Hunter (Western Electric Company, Inc.)

Sponsor's Delegate: Joseph M. Cameron (N.B.S., Washington, D.C.)

Delegates: C. James Leaney (Ball Brothers Research Corporation)
    Maurice J. Sexey (Aerojet Nuclear Company)
    Lewis G. Fauble (Monsanto Research Corporation)

Committee Chairmen:

Meetings & Programs (1A) - Andy J. Woodington (General Dynamics/Convair)

Honors & Awards (1B) - Al Kelsey (R. C. A.)

National Measurements Requirements (2A) - Marilyn L. Hed (T.R.W. Systems)

Calibration Systems Management (3A) - Laurel M. Auxier (Beckman Instruments)

Edward Bader (General Dynamics/Electrodymanics)

The minutes of the October 17 and 18, 1972, Board of Directors Meeting were approved as published.

Executive Vice President's Report:

Don Greb distributed NCSL Bylaws, as revised at the October Board Meeting. It was suggested that the revised Bylaws be distributed to the membership.

A motion to amend the NCSL Bylaws was approved as follows:

Section II, Subsection B, add -

"7. Participating in those activities which result in origination or revision of specifications - military or otherwise - governing testing, test and measuring equipment, calibration, and calibration systems."
MINUTES - continued

Secretary's Report

Jim Valentino reported that he had a new tabulation of current (paid-to-date) NCSL members.

President Ralph Barra charged Jim Valentino and Paul Hunter to establish a program for NCSL "dues" invoicing. The invoice should not be mailed prior to January 1 and must have follow-up on delinquent accounts by March 1.

Action Item - Jim Valentino will send a list of all current and past NCSL members to Regional Coordinators and Delegates to the Board of Directors.

Treasurer's Report

As of January 22, 1973, the NCSL savings account has been closed and all funds have been transferred to the checking account. The checking account balance at the end of January, 1973 was $8,640.20.

Carl Boyer moved that the NCSL Treasurer be authorized to make investments (Savings Certificates) to further the goals of NCSL. Joe Cameron seconded the motion, which was approved.

Don Creb moved to accept the Treasurer's Report. Carl Boyer seconded the motion, which was approved.

Sponsor's Report

Joe Cameron reported that NBS has a new director - Dr. Richard W. Roberts. Dr. James Seed's Economic Report on the National Measurement System is progressing smoothly. The Bureau of Standards Measurement Assurance Program is now asking "Does the measurement system produce data that is sufficient for the intended use?"

Vice President's Report - Administration

Mort Angelo introduced Al Kelsey, new chairman of the Honors and Awards Committee. Ralph Barra charged the Board to notify Al Kelsey when regional meetings are conducted so that the host of the meeting and other contributors to NCSL goals can receive "Certificates of Appreciation". Ralph wishes to see the certificates sent out on a continuous basis rather than only at the end of the year.

Ralph Barra presented Committee Chairman Marshall Brenner's Education and Training Committee Report.

Vice President's Report - Measurement Requirements

Ray Bailey reported that the National Measurements Requirement Committee will be chaired by Marilyn L. Hed of TRW Systems Group, One Space Park, Redondo Beach, California. Ray Bailey also reported that NCSL will participate in Dr. Seed's National Measurements System Study. Letters have been sent to
all NCSL members requesting they submit an outline of their measurement program and the relation to other agencies, both governmental and industrial. This study, displaying the economic impact that measurement programs contribute, will be useful to NCSL members.

Vice President's Report - Laboratory Management and Operations

Dave Mitchell reported that the Calibration Systems Management Committee will draft a position paper on a feedback system on "out-of-tolerance" conditions.

The Product Measurability Committee, chaired by Rolf Schumacher, will assist Dr. Seed in the technical assessment of the National Measurements System Study. Examples will be presented relating the product to the measurement standards and the cost impact that the measurement system has on the product. The two major products of the Committee will be 1) "on-line" technical audits and procedures program - subelement to calibration and 2) cost impact of measurement resources on product - the direct relationship of each.

An additional study of the Product Measurability Committee will be the investigation of automatic diagnostic/repair maintenance systems. Maintenance has much more cost impact than pure calibration.

Vice President's Report - Communications and Marketing

Carl Boyer reported that two items concerning the operation of the NCSL Newsletter should be resolved by the Board:

1. Approval or revision of the NCSL Newsletter Operating Policies as distributed by mail, and

2. Provisions for expense advance of $1,200 for the Newsletter publication.

Item 1 was accepted as revised by the Board. Item 2 does not require Board action since it is covered in the Newsletter's operating budget.

Carl Boyer reported that Elmer Rogers, Chairman of the Recommended Practices Committee, suggests that "the Committee seek out specific measurement problems, develop ad-hoc committees to generate optimum solutions through seminar activity, and publish those solutions as recommended practices".

The Board accepted the suggestion and chartered the Committee to develop a coordination effort between other NCSL Committees and other agencies or organizations.

Delegate Members' Report

Jim Leaney reported that there exists among some member organizations a feeling that NCSL has not communicated to its members what assistance NCSL can provide. The small laboratories are usually the ones that can benefit most from NCSL products and yet most do not know where to go for assistance.
Carl Boyer reported for Marshall Brenner that Regional Meetings have been held and that Region 3 is currently engaged in a Round - Robin program.

Members in Region 5 feel that there is a definite need for a Laboratory Certification System, so that member organizations can assess themselves. O.S.H.A. requirements are also of interest to many members.

The board discussed the past NCSL publications and their availability to the members. Lewis Wears will investigate their availability. The value of establishing a numbering (index) reference system was suggested by Jim Valentino to inform the membership of publication availability.

**JOURNAL OF APPLIED METROLOGY**

Joe Cameron suggested that the reports of the Joint Measurement Conference could be used as volumes to the Journal. Joe also feels that all organizations (I.S.A., A.S.Q.C., I.E.E.E., N.C.S.L., etc.) involved in metrology of some nature, should sponsor and support the Journal.

Carl Boyer reported that the I.S.A. could publish the initial Journal for $7,500.00 for 2,500 copies. Additionally, he reported from the minutes of I.S.A.'s Publications Department meeting the following:

1. Carl Boyer reported for an ad-hoc committee representing I.S.A., P.M.A., and N.C.S.L.

2. The committee has concluded that there is a definite lack of publications in the area of metrology.

3. Intention is to introduce a new Journal if adequate subscription and publications support can be found.

Carl Boyer was asked to present a proposal or recommendation to the Board at the next Board of Directors Meeting.

**Membership Certificate**

Don Greb discussed the revision of the membership certificate which will now be an embossed plaque type issued once only to each member organization. A mission statement has also been added to the certificate:

"Organized to support the common interests of the measurement community, through the interchange of management and technical information."

**Joint Measurement Conference (JMC) Proceedings Purchase**

Ralph Barra reported that the 1972 JMC Proceedings are available to NCSL at $4.60 per copy.

Maurice Sexey moved that the NCSL purchase 200 copies of the JMC Proceedings and distribute a copy to each NCSL member organization. The motion was seconded by Lewis Fauble and approved.
MINUTES - continued

NBS Study - National Measurement System

Ralph Barra reported on the progress of Dr. James Seed's study of the National Measurement System.

Current Awareness Service - NBS

Wilbur Anson reported that NBS will offer the following:

1. A group rate to NCSL for the Current Awareness Service.

2. A one year trial subscription to NCSL for the Service at a cost of $3,000.00 for 200 copies.

Maurice Sexey moved that the NCSL allocate $3,000.00 for one year trial subscription to the Current Awareness Service. Each NCSL member delegate is to receive the service free of charge for one year. The motion was seconded by Lewis Fauble and approved.

1973 NCSL Conference

Conference Chairman, Andy Woodington, reported that the 1973 NCSL Conference is scheduled for November 14, 15 and 16, 1973, at NBS, Gaithersburg, Maryland. The Board felt that the Park Sheraton, in Washington, would be used as hotel headquarters. Ralph Barra suggested, if possible, using video-tape to record the Conference.

1974 JMC Conference

The Board has agreed that NCSL will participate and sponsor a 1974 JMC if the JMC Committee wishes to hold same. Carl Boyer will represent NCSL at a JMC Steering Committee Meeting held on January 26, 1973. The Steering Committee will be represented by P.M.A., I.S.A., N.B.S., N.C.S.L., A.S.Q.A., and I.E.E.E. Carl Boyer will report the minutes to the Board.

NEXT BOARD MEETING

The next NCSL Board of Directors Meeting is tentatively scheduled for May 17-18, 1973 at Patrick Air Force Base, Cocoa Beach, Florida.

The Board of Directors wishes to express their gratitude to Andy Woodington and General Dynamics for hosting this meeting.
James A. Valentino - NCSL Secretary  
(Sanders Associates, Inc.)

James A. Valentino received his B.S. degree in Electrical Engineering from Merrimack College. His graduate studies include engineering at Northeastern University and management at the University of New Hampshire. He has been employed at Sanders Associates, Inc., since 1966 and currently holds the position of Manager, Test Equipment Control/Calibration Management. He established the Company's Reference Standards Laboratory in 1967 and was instrumental in having the organization join NCSL in 1968.

Prior to joining Sanders, Jim was employed with the AVCO Corporation, Wilmington, Massachusetts and was engaged in RF/Microwave metrology.

A delegate to NCSL since 1968, Mr. Valentino has served as member, and later as chairman of the Calibration Systems Management Committee, and Delegate Member to the NCSL Board.

Paul H. Hunter - Treasurer  
(Western Electric Company, Inc., N.C.)

Paul H. Hunter is currently serving as Treasurer on the Board of Directors, NCSL. He has previously held the office of Secretary and as Chairman of the Information Committee and has twice served on the Nominations Committee.

Paul has been in charge of measurement standards at the North Carolina Works of the Western Electric Company for the past fifteen years, prior to which he was with the Bell Telephone Laboratories Military Electronics Development Group. He is the author of numerous papers and a book on electrical measurement and instrumentation and has lectured extensively. From 1958 through 1961 Mr. Hunter held various offices on the Executive Board of the North Carolina Section of the Institute of Radio Engineers.
Committee 1A - Meetings and Programs
Chairman: Andy J. Woodington of General Dynamics/Convair

The 1973 NCSL Conference is to be held November 14-16, 1973 at the NBS Facilities at Gaithersburg, Maryland. The Headquarters hotel is the Park Sheraton, in Washington, D.C. Attendees will be bussed to NBS.

There will be two days of technical programs, November 14 and 15 and one day for NCSL Delegates meetings and NBS tours, November 16. In the planning are an informal social on the evening of November 13, where the attendees can meet with board members and each other. A dinner program is being planned for the evening of November 14, at the Park Sheraton Hotel.

The technical program is to have considerable audience participation - approaching a workshop. The four sessions - two each day - are as follows:

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<td>Test Equipment Utilization &amp; Management</td>
<td>D. R. Townsend, Lockheed Missiles &amp; Space Co.</td>
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<td>Regulatory Agencies and their Impact on Metrology</td>
<td>Ted R. Young, NBS, Gaithersburg</td>
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<td>Measurement Problems of the Small Metrology Laboratory</td>
<td>Saul Alford, Argonne National Laboratory</td>
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The Conference Arrangement Chairman is W. R. Tilley of NBS, Gaithersburg. The Conference General Chairman is Andy J. Woodington.

Committee 1B - Honors and Awards
Chairman: Al Kelsey of R. C. A.

Permanent NCSL membership plaques have been received and will be distributed shortly.

Committee 1C - Education and Training
Chairman: Marshall H. Brenner of Boeing Company

It is the objective of the Education and Training Committee to act as a source for the procurement of such text by the membership at a discount. The exact discount will depend upon your response to the Education and Training Committee and upon the publishers quantity versus discount rule. In the next issue of the Newsletter, a quotation from the publisher will be provided to define his off-the-shelf price versus a discounted price. It is requested that you do not place an order through the Chairman of the Education and Training Committee for these until such time that the exact price has been defined and published.
"Handbook of Dimensional Measurement" by Farago, Industrial Press, 1968

The text is a general treatment of all subjects important to mechanical gaging from the rudimentary devices to the state-of-the-art, at least up to 1968. Recent advances such as the use of lasers and dimensional measurement have not been covered. The intended audience appears to be the engineer who may be lacking in specific measurement knowledge and to the advanced technician. The coverage of roundness, surface finish, microscopes, projectors and angle measurements are very well done. In general, the text is very well written and easily understood with the exception of a tendency to over qualify statements and to use words without definition of meaning. It is less theoretical than the ASTME Handbook of Industrial Metrology and is probably of more value as a handbook for reference rather than for training purposes.

"ASTME Handbook of Industrial Metrology" by P. W. Wilson, Prentice Hall, 1967

This book is directed to the task of providing an authoritative reference to all important areas of measurement related to mechanical structures. As such, it covers the conventional dimensional gages, projectors, interferometers and electronic gages, linear measurements, optical alignment, surface texture, gears and screw threads. The text is theoretical but does include many examples, drawings, tables and equations. It does feature one outstanding chapter on "Statistical Concepts in Metrology" which is a must reading for metrologists. Missing are such techniques as the laser methods and an explanation on holography. Similar to the "Farago Handbook of Dimensional Measurement", this book is directed to the engineer and has more use as a handbook than as a training text.

"Basic Electrical Measurements" by M. B. Stout, Prentice Hall, 1960

As one can infer from the date of publication, this book is badly outdated in that it provides no coverage on inductive dividers, progress in transformer testing, current comparators, thermal converters, potentiometers, resistive dividers and ratio sets. However, the subjects which are covered are done thoroughly and direct themselves to the undergraduate or metrologist.


This is a text in statistics which uses data from physical measurements for its examples and problems. The author treats his subject like a man from Quality Control, rather than from Metrology. His definitions reflect this in that they might be useful to a man interested in dealing only with the variability of product, but not with the variability of a measuring
system (e.g., he is satisfied to deal only with those bias factors for which magnitude and sign are known and offers no help to the metrologist who has to allow for all bias factors, known, partly known, and unknown.)

Although the author has titled the book, "Measurements", his treatment in this area is superficial from the metrologist's viewpoint. It is well written and easily understood. It's directed to the engineer and quality control man.


This is a how-to-do-it book on the basics of mechanical inspection. The major portion of the book is addressed primarily to the man at the bench and his supervision. The two chapters, "Gage Checking and Calibration", and "Measuring in Millionths" increase the scope of the book considerably however, and properly add gage and inspection engineers to its audience. For the metrology laboratory, it would be useful as initial training and reference material for the newly hired dimensional technician and engineer.

Similar to some of the preceding text, this one is becoming outdated in that it treats interferometers and moiré techniques briefly and totally ignores the laser and problems with the numerical controlled machines. Additional well covered areas include fixed gages, surface plate methods, mechanical indicating equipment and screw threads. The book is well written, making it easy to read and could serve as a training text, however, it lacks any specific problems for the use of an instructor.

VIDEO TRAINING TAPES REVIEW

In an effort to initiate some activity in the video training tape area, seven tapes have been purchased:

1. Practical Transistors - Logical troubleshooting (32 minutes)
2. Troubleshooting Transistor Circuits Faster (17 minutes)
3. Choosing the Right AC Voltmeter (20 minutes)
4. Electronic Counter Tutorial Series
   a) Basic Electronic Counters (17 minutes)
   b) Count Any Signal (10 minutes)
   c) Time Interval Measurements (15 minutes)
   d) Time Interval Averaging (24 minutes)
VIDEO TRAINING TAPES REVIEW - continued

It is the current plan to add additional copies as a direct function of membership response. If the demands for these tapes are sufficiently high, we will continue to increase the quantity until such time that we are able to meet membership requirements within a practical turn-around time.

In addition to this, there are still seven other Hewlett Packard tapes which have been identified of major interest to the membership:

1. Oscilloscope Basics
2. Sampling Oscilloscopes
3. Understanding Storage Oscilloscopes - Theory
4. Sound Measurement Equipment
5. Computing Counter
6. Guide to Digital Magnetic Tape Recording
7. Sony Videotape Recorder

Interested membership should contact: Marshall H. Brenner
Orgn. 2-4852 M.S. 87-46
Boeing Aerospace Company
P. O. Box 3999
Seattle, Washington 98124

to schedule use of the tapes. Interest in additional tapes should be brought to the attention of Mr. Brenner for consideration of purchase and addition to the NCSL tape library.

MEASUREMENT REQUIREMENTS COMMITTEES - RAY BAILEY

Committee 2A - National Measurement Requirements Committee
Chairman: Marilyn L. Red of TRW Systems

This issue of the NEWSLETTER contains articles by Wilbur J. Anson and Dr. James R. Seed concerning the NBS Study of the National Measurement System (NMS). Please submit your data to Dr. Seed if you have not already.

Committee 2B - Lab Evaluation

This committee is still in need of members and a chairman. Please contact Ray Bailey @ 614-522-2171, ext. 490, 495, if you are interested.

Committee 2C - Medical Electronics
Chairman: Wesley R. McPhee of MIT Draper Laboratory
LABORATORY MANAGEMENT and OPERATIONS COMMITTEES - DAVE MITCHELL

Committee 3A - Calibration Systems Management Committee
Chairman: Laurel Auxier of Beckman Instruments, Inc.

An ad-hoc subcommittee has been formed to investigate the relative merits of feedback systems for out-of-tolerance data obtained at the recalibration of measuring and test equipment. The subcommittee is chaired by Rolf Schumacher, Autonetics; active subcommittee members are Donald Horton, Litton Systems and Marilyn Hed, TRW Systems. The subcommittee is weighing the answers to questions such as:

1. What purpose would such a system serve? (Preventing acceptance of out-of-tolerance products; reducing total quality costs?)

2. Should such a system be employed?

3. Are alternative methods known to achieve the same goals?

4. What are the costs and benefits of a feedback system and of alternative systems?

Two independent reports have been drafted by the subcommittee.

The subcommittee met on February 26, 1973, to draft a combined report for submission, discussion, and possible amendment by the Region 13 NCSL membership. Any contribution to the subject will be highly welcomed by the subcommittee.

COMMITTEE 3A MEMBERSHIP

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714-632-2685
The Measurement Assurance Committee has initiated planning an interlaboratory intercomparison utilizing digital voltmeters and zener transport voltage standards. All committee members as well as the NCSL Regional Coordinators have been contacted regarding a program. Response has been most encouraging.

Several phases of this program are presently being finalized. Based upon the success of the Regional activities, particularly Region #3 under the Chairmanship of Moe Corrigan (Lockheed Electronics, New Jersey), it has been concluded that regional round robins can be performed fastest yielding timely results to the participants.

Several sources of transport standards have been contacted and at this time it appears that a sufficient number of member organizations are willing to loan instruments for this interlaboratory intercomparison. Additional inputs are welcomed.

Mr. Norm Belecki, NBS Chief of the Electrical Reference Standards Section, has expressed an interest in performing supporting measurements at his laboratory. Plans are underway to arrange for NBS to be the central point for referencing all measurement data.

In addition to the Region #3 Laboratories presently participating in a round-robin, the following laboratories have indicated an interest in participating:

- Sandia Laboratories, Albuquerque, New Mexico
- Sanders Associates, Inc., Nashua, New Hampshire
- John Fluke Manufacturing Company, Seattle, Washington
- Bureau of Mines, Twin Cities, Minnesota
- Univac, St. Paul, Minnesota
- Hewlett Packard, Sunnyvale, California
- NASA/Marshall Space Flight Center, Huntsville, Alabama
- E. I. DuPont de Nemours, Aiken, South Carolina
- NASA/Johnson Space Center, Houston, Texas
- Western Electric Company, Inc., Winston Salem, North Carolina
- Union Carbide Company, Oak Ridge, Tennessee

At this time, additional participants in this program are being solicited. If you have not been contacted to date and you are interested in participating in this round-robin, please write or telephone:

Mike Suraci, CO-3
Lockheed Electronics Co., Inc.
16811 El Camino Real
Houston, Texas 77058
713-483-3105

Additional Measurement Assurance activities are included in this Newsletter as separate articles. Our thanks to Dave Mitchell and his staff at Automation for their excellent contributions. Similar activities from your laboratory are most welcome.
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T R W Systems Group
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714-629-5111, ext. 4633

Hartwell C. Keith
Philco-Ford Corporation
Aeronutronic Division
Ford Road
Newport Beach, California 92663
714-640-1500, ext. 1058

David B. Schneider
Lockheed Missiles & Space Company
Department 48-64, Building 151
Sunnyvale, California 94088
408-742-4421

Robert Padrick
USN Metrology Engineering Center
1675 West Mission Boulevard
P. O. Box 2505
Pomona, California 91766
714-629-5111, ext. 8175
COMUNICATIONS and MARKETING COMMITTEES - CARL BOYER, JR.

Committee 4A - Newsletter
Chairman: J. Michael Suraci of Lockheed Electronics Co., Inc.

My thanks to everyone for their fine comments on my first issue of the NCSL NEWSLETTER. Your cooperation is appreciated and essential to the publication of a high quality newsletter.

Several Member Delegates have accepted my invitation to submit feature articles. This issue contains several fine examples; i.e.: "Comments about O. S. H. A.", received from Lewis R. Wears of the Johns Hopkins University Applied Physics Laboratory and the "Western Standards Laboratory" article received from Larry R. Becht, Head of the Naval Air Rework Facility's Laboratory.

Please accept my invitation to send news of interest to the membership. I would like to feature an article on a member organization's laboratory each issue. Future issues will also contain articles on the officers of the NCSL. Please write to:

Mike Suraci, Co-3
Lockheed Electronics Co., Inc.
16811 El Camino Real
Houston, Texas 77058
or Telephone: 713-483-3105

Committee 4B - Information and Directory
Chairman: Lewis R. Wears of the Johns Hopkins University
Applied Physics Laboratory

The new edition of the NCSL Directory is ready for distribution.

Committee 4C - Calibration Procedures
Chairman: M. L. Vyenielo of Lawrence Livermore Laboratory

Automatic measurement and test equipment is being purchased by many companies and agencies to replace the discrete test instruments operated by technicians using written calibration procedures. Conversations with users and potential users at our Region 12 meeting indicated a growing concern over the lack of a library of programs to use with these systems. We are interested in feedback from members in other Regions.

Indexing Codes for Calibration Procedures were reviewed by this committee. A recommendation was made to the GIDEP Administration Office that we adopt a code similar to that used by Rockwell International.

Many inquiries have been received about the Government Industry Data Exchange Program (GIDEP). There are three major data banks currently in operation. One contains information on parts, components, material, and manufacturing processes. The second contains calibration procedures, while
CALIBRATION PROCEDURES - GIDEP - continued

the third, FARADA, Failure Rate Data Program, provides reliability information. Planned revisions to the GIDEP charter would allow industrial participation in all three banks. In addition to the data bank, GIDEP operates an ALERT reporting system that notifies all participants of a significant part, material, test equipment, process or safety problem of general concern. Any GIDEP participant may submit an informal request to all participants for specific part, component material, test equipment or process information by submitting an Urgent Data Request (UDR) to the GIDEP Administration Office. A UDR is usually reproduced and distributed to all participants within 24 hours.

Plans are being made to add two more data banks to GIDEP, the International Exchange of Authenticated Electronic Component Performance Test Data (EXACT) and SETE (Secretariat for Electronic Test Equipment). SETE serves as a national center for the coordination, analysis and exchange of scientific, technical, and management information in the field of electronic test, checkout, and support equipment.

Members are urged to submit their inputs to:
Marty L. Vyenelo 1-152
University of California
Lawrence Radiation Laboratory
P.O. Box 808
Livermore, California 94550

Committee 4D - Standardization of Measurement Practices
Chairman: Elmer E. Rogers of Harry Diamond Laboratories

The measurement community will come under increasing scrutiny soon. New environmental and consumer protection legislation will have impact on manufacturers, service industries, consumers and finally the courts. Increased implementation of measurement assurance programs also will be felt. The approach to problems of measurement equipment and techniques by competent professionals often varies. Results may, therefore, differ significantly. Administration or judicial findings of fact and conclusions of law may be affected by these differences. The settlement of disputes involving future occupational exposure claims, environmental impact statements, or consumer complaints may hinge upon such measurements. Therefore, measurements whose accuracy can be seriously questioned may have substantial financial consequences.

A number of measurement problems that vitally effect consumers and manufacturers must soon be resolved. It would be unfortunate if these problems were resolved by an administrator or jury of laymen on the basis of opposing expert testimony rather than by the professional measurement community. A program proposed by the Recommended Practices Committee and approved by the last NCSL Board Meeting may prevent this from happening. The program goals are to define current and projected measurement problems and to indicate an initial NCSL position on the suitability of a given practice. Agreement would be obtained, as necessary, on the equipment required and its maintenance, the measurement technique and procedure, the competence level of the users, the numerical value of the constants used, and the manner in which the integrity of resulting data is preserved. Such action would standardize the specific practices involved in making a given measurement.
STANDARDIZATION of MEASUREMENT PRACTICES - continued

To achieve these goals within the NCSL Charter, the following procedures will be followed by this Committee. Papers defining particular measurement problems and proposing a practical solution will be solicited. Summaries will be published in suitable journals with invitations for papers on alternate solutions. If no reasonable alternative solutions are proposed within an appropriate period, the method will be published as Recommended Practice by NCSL. Otherwise, an open forum will be called by the society to consider all objections and alternatives and to agree on a solution that shall become a Recommended Practice. Whenever necessary, additional forums shall be held to modify or reaffirm Recommended Practices. Proceedings of the meeting, including majority and minority reports, will be published.

This plan, though far from complete, could provide a more meaningful means of settling controversial measurement problems than is now available. Use of the approved practices will distinctly improve the quality of measurements as well as the efficiency of the performing laboratories. Initial efforts will be limited to only a few problems. Detailed operational guidelines will be established and additional problems will be considered as experience is gained from these efforts.

In addition to laboratory-type measurement problems in the physical sciences, the Committee will consider others in fields such as medicine, civil engineering, and industrial and consumer safety, especially if adequate measurement technology exists but where differences have not been resolved. The Committee will in time consider such controversial measurements as those used in determining whether a system is in compliance with the Occupational Safety and Health Act and those necessary to implement and quantify environmental quality standards.

We request the definition of existing measurement problems, as well as papers proposing practical solutions. Any format is acceptable. Send papers to:

Elmer B. Rogers, Chairman
NCSL Recommended Practices Committee
Harry Diamond Laboratories AMXDO-EDG
Washington, D. C. 20438
The fifth meeting of delegates and other representatives of member companies in NCSL, Region #3 was held at the Bendix Corporation, Navigation and Control Division, Teterboro, New Jersey - on Thursday, January 11, 1973. Attendees were welcomed and the meeting started at 9:30 a.m. with the following agenda as outlined in a previous letter from Region #3 Chairman - Moe Corrigan.

A. Report from the Board of Directors
B. Single Element Gaging of Screw Threads
C. Report on Measurement Capability Charts
D. Regional M. A. P.
E. Current Awareness Service

Carl Boyer who has done such a fine job as liaison agent between our region and the national level, reported on the latest NCSL Board Meeting. Since most of this was already reported in the NCSL newsletter, he merely touched on some of the high points. One of the many things Carl plans to do is to publish a critique of the Newsletter. He would welcome any comments as to format, style or content.

The next Board of Directors meeting will be in California on January 25th and Carl will relay information from our meeting to the Board at that time. An action item that Carl will try to get resolved is our comments regarding the Current Awareness Service - that this service be provided as a free subscription to all NCSL members.

Carl also requested that we follow up on membership dues requests. Some of the delegates admitted that after they turned in request for payment of dues they did not follow up to confirm that they were paid. It was suggested that some reminder or notice of non payment of dues to the delegate of the delinquent Company would probably bring the desired results.

A new NCSL directory is due in March. Carl commented favorably on the change to the election process by mail ballot rather than the previous process of election at a national meeting.

Lynn Baska of the Johnson Gage Company presented some seminar material related to the measurement requirements for single element screw thread gaging. This was timely in view of the Air Force interest in enforcement of these requirements in compliance with Notices 1 and 2 to MIL - S-8879A & MIL-S-7742B. The seminar material included film slides and a demonstration of the various gages needed. Measurement parameters of roundness, taper, pitch diameter, maximum metal condition, minimum metal condition, major diameter, root diameter, thread angle, thread radius and thread drunkeness
MINUTES - REGION 3 continued

were described and gaging demonstrated on how to measure these different parameters, either as a differential measurement or as a single element measurement. At the conclusion of the lecture questions were answered and literature was made available for those interested.

Joe Gyurian presented a report with some actual data on his measurement capability charts. It was agreed that his original purpose as to format for the charts may be a little too busy. Herb Ingraham volunteered to provide a universal chart format for plotting measurement capability for any parameters but on an individual chart basis. Joe will then review this universal chart to see how it fits in with his original ideas. One of the main problems is getting this project going has been lack of measurement capability input from regional members. This information may be more readily available once the regional Measurement Assurance Program (MAP) starts.

Max Unis commented on the difficulty in interpreting measurement capability on a percentage basis. He felt that an actual number for each measurement range would be more readily understood. Other delegates felt that in some cases a parts per million capability statement was better.

The regional Measurement Assurance Program (MAP) has gotten off to a good start. All nine of the member delegates present will participate in the current program. Moe Corrigan will act as a regional coordinator and plans an active program which will result in completion of the round robin by the next regional meeting.

Four measurement parameters were selected:

1. Resistance at 1 ohm and 1 K
2. Voltage at 1.01 V and 10 V
3. Hardness on "B" scale at RB 43 63 and 83
4. Length at .250 and 2.000

Moe will provide work sheets and instructions and make sure that round robin schedules are maintained. Each company will have the standards for one week. The data will be sent to Bob Verity of Leeds & Northrup on unidentified work sheets for analysis and completion. Participating companies and the parameters of interest are listed below. The tentative schedule will be in the order listed - one week for each company.

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The standards to be used in the round robin will be provided by the following companies:

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<th>Measurement Parameter</th>
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<td>Hardness</td>
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One measurement parameter suggested for future round robins was that of surface texture or surface finish.

Moe Corrigan commented on the draft of a position paper on "A Mandatory System for Feeding Data of Out-of Tolerance Measuring Instruments Back to the USER." Each member was given a copy of the paper along with a copy of comment by J. D. Mitchell of Autonetics which were generated in response to a NCSL Calibration System Management Committee Questionnaire.

During the discussion Carl Boyer mentioned that he was not aware of any activity on MIL-C-45662-B which had some requirements for a system of this type.

No general agreement was reached to support the position outlined in the paper. Some members felt that a system such as this would of necessity have to be tailored to contractual requirements, historical data and costs.

The next regional meeting was tentatively set for May 10, 1973 with a probable location at one of the R.C.A. plants.

Some agenda items being considered for the May 10, meeting are listed below. Contact Moe Corrigan if you have any other suggestions for agenda topics.

- NCSL Board of Directors Report
- Current Awareness Service
- Measurement Capability Study
- M. A. P.
- Statistical Analysis of Measurement Errors
- Audit System (Ralph Barra)

The meeting was adjourned at 3:30 p.m.

Attendees:
- John Attanasio, Jr. - I.T.T. Defense Communications
- Carl Boyer - Honeywell Inc.
- Fred Constantine - Blanchette Company
- Moe Corrigan - Lockheed Electronics Company
- Jim Dock - Bendix Corporation
- Joe Gyurian - Lockheed Electronics Company
- Bill Henderson - Computer Diode Corporation
- Herb Ingraham - R. C. A.
- Ken Koep - Computer Diode Corporation
- Gary Sweetman - Sweetman Calibration
- Max Unis - Gage Laboratory Corporation
- Bob Verity - Leeds & Northrup
- Lynn Baska - Johnson Gage Company
The eighth meeting of Region Five was held on January 10, 1973, at the main offices of E. I. L. Instruments, Inc., Timonium, Maryland.

Ralph Barra discussed failure mode analysis especially relating to standards used in plant production. He mentioned the need for more thorough analysis of calibration intervals versus the actual quality level of production test equipment. Mr. Barra also mentioned the possibility of an independent standard, calibrated by the National Bureau of Standards and circulated to N. C. S. L. members for standardization sampling.

Carl Boyer discussed the N.C.S.L. organizational chart calling attention to its latest additions and changes, and the 1973 N.C.S.L. budget. Mentioned also was his intention of streamlining members dues collections and further discussions will be brought up at the next board meeting.

Carl Boyer requested that members, after reviewing past N.C.S.L. Newsletters, pass any comments, positive or negative, on to himself and the new Editor, Mike Suraci. Carl further discussed the use of the Regional Meeting as a communication link from the region to the N.C.S.L. Board.

Mr. Barra asked that organizations that are interested in submitting information such as stories, experiences or events of interest to other members, should be sent to the N.C.S.L. Newsletter for publishing in order to achieve better personal communications between members.

Mr. Lewis Wears gave a general briefing on the Occupational Safety and Health Act (OSHA) mentioning some of the various requirements such as noise level measurements in various manufacturing industries, etc. Standards already set and future requirements of OSHA will have broad effects on industry in general. Since N.C.S.L. will be directly and indirectly affected by the Act it was agreed upon by the members of today’s meeting that future discussions will be held at forthcoming N.C.S.L. meetings.

Elmer Rogers discussed future plans for Recommended Practices Committee action.

The meeting adjourned at 4:00 p.m. after the members toured the facilities of E.I.L. Instruments' Primary and Secondary Calibration Labs.

The next Region Five meeting is tentatively scheduled for May 9, 1973.

Attendees:
Ralph J. Barra - Westinghouse  * Lewis Wears - APL/Johns Hopkins
Carl Boyer, Jr. - Honeywell * John C. Parker - York Info. Systems
Jim Bray - Tektronix * John DiGilio - EIL Instruments
Dennis Downing - Tektronix  * Gerhard Sweetman - Sweetman Calibration
Elmer Rogers - Harry Diamond Labs * Marion W. Cain - Va. Dept. Agriculture,
John W. Rodgers - Bendix Comm’s * Dept. of Weights and Measures
The Northern California Group met at the Hewlett-Packard Company on February 27, 1973.

Announcements of coming events of interest were made by Don Greb and John Minck.

National NCSL Actions were transmitted from Maurice Sexy who was unable to attend.

Don Greb reported on the National Measurement System Project now underway at NBS by Dr. James Seed. Don will accept inputs from our group for further action by the board. Don will also send out copies of an earlier questionnaire from Wilbur Anson which is related.

Discussion also followed on a previous study done by Mort Angelo on NCSL member organization structures, management reporting, etc. The group felt it would be valuable to update it and Don Greb will propose that to National.

The California Measurement System was described as a local desired alternative to using NBS calibration service. So far two State Labs of weights and measures and two Industry Labs are qualified to perform legal calibrating. Mass and length are covered to date, but the State Advisory Committee is looking into priorities for other capabilities and disciplines which may be performed in other qualified labs. Don Greb is a member of the State Metrology Advisory Committee and will accept inputs.

Discussion centered around new quantities now required by law such as noise, effluent, pollution, and light. It was felt that certain calibrations might be shared so that each company would not have to set up extensive capability.

Several members are trying to set up instrument pools and solicited ideas for justifying such systems and tactics for implementing. Three or four members use pools and find them effective and economic but difficult to set up.

Al Kohler and Bob Delapp expressed concern on technician availability and the level of training from the local junior colleges. It was felt that the military which has supplied many technicians will dry up as pay scales go up. Programs to enhance the junior college output have been disappointing and require industry to furnish both instructors and students. The local ASQC has heavily supported local courses and have been quite effective.

Attendees:

Don Greb  Locke (LMSC)  *  L. Dunkelburger  Kaiser Aero
Howard Bailey  McClellan AFB  *  Al Schmidt  McClellan AFB
Bob Delapp  SRI  *  Neil Neilsen  Hewlett Packard
Ben Bogden  Westinghouse  *  Bob Littlefield  Hewlett Packard
Al Kohler  Varian  *  John Minck  Hewlett Packard
Marty Vyeniello  Lawrence Livermore  *  John Larson  Systron-Donner
Karl Tampier  Fairchild  *  Jim Erdele  Dalmo Victor
PROGRESS OF THE NATIONAL MEASUREMENT SYSTEM STUDY

WILBUR J. ANSON
N.B.S., Boulder, Colorado

I've promised to put together a column on the progress of the National Measurement System (NMS) Study for each issue of the Newsletter. Most of the material will come from input that Dr. Seed has received for the study. However, letters from NCSL member delegates specifically for this column are invited and welcomed.

Next issue we'll publish one company's measurement relationship and dollar impact chart (with their permission) plus some observations from interviews with industrial measurement people.

In this issue, Jim Seed discusses the philosophical framework of the NMS Study.

THE NATIONAL MEASUREMENT SYSTEM - NCSL

JIM SEED
N.B.S., Washington, D.C.

As we attempt to understand our society today, it becomes increasingly necessary to take a "systems" approach. Present day technology, social organizational structures, economic interactions, and the national and world political structures interact in such a complex mode today that we cannot understand simple structural relationships unless we deal with an entire "system." Thus, we think of our current society in terms of a group of overlapping "Systems".

1. a national legal system
2. a national educational system
3. a national communications system
4. a national transportation system
5. a national monetary system

The systems will overlap, but they will, nevertheless, have systematic identities.

The structural relationships within these systems will range from very strong statutory requirements to weak conceptual interactions. To the people who are vital components of these systems, it is becoming more and more important, when doing long-range planning and resource allocations, to understand the nature of the entire system. If this is not done by the component laboratories and subsystems, the entire systems, which are dynamic and subject to change, will find that their contributions are no longer relevant. While these generalities are true for all the social and economic systems mentioned, they are especially true for the social-economic system with which we are most concerned, the National Measurement System.
NATIONAL MEASUREMENT SYSTEM - continued

If we go back to the writings of Adam Smith, the so-called father of economics, we find the need for accurate and transferable measurement to be a fundamental need for equity in trade and an absolute must for any economic system to function. If we study the history of the formation of our own republic, we see that the need for transferable measurement was one of the many needs motivating our founding fathers. An interesting statement by John Quincy Adams in 1821 shows how he valued the "measurement system" of that time.

Weights and measures may be ranked among the necessaries of life to every individual of human society. They enter into the economical arrangements and daily concerns of every family. They are necessary to every occupation of human industry; to the distribution and security of every species of property; to every transaction of trade and commerce; to the labors of the husbandman; to the ingenuity of the artificer; to the studies of the philosopher; to the researches of the antiquarian; to the navigation of the mariner, and the marches of the soldier; to all the exchange of peace, and all the operations of war. The knowledge of them, as in established use is among the first elements of education, and is often learned by those who learn nothing else, not even to read and write. This knowledge is riveted in the memory by the habitual application of it to the employments of men throughout life.

Like other social-economic "systems", such as the monetary system, which are absolutely necessary for commerce and technological growth, the measurement system is dynamic—rapidly changing in time. Its infrastructure must adjust to economic trends, national priorities and technological innovation. To facilitate this necessary adjustment, we must be continually appraised of its current definition, scope, infrastructure, communications channels, economic dimensions and impact.

The National Conference of Standards Laboratories represents some of the most important components of the National Measurement System. Yet, are the member laboratories truly familiar with the system? As the systems' needs change do the member laboratories adjust their approach to servicing these needs in an enlightened systematic fashion? Do the member laboratories have an understanding of the economic dimensions of the system? Do the member laboratories really understand how important this system of physical measurement is to the world? To the country? To a specific laboratory? To the role of growth of certain industries? To their own parent organization? If we said that in 1963 industries spent 14 billion dollars maintaining their portion of the system and 1.3 million man years making the measurements, would you be surprised? If we estimated that industries spent 27 billion dollars in 1972 on measurement, would that surprise you? Could you estimate the number of dollars that will be spent in 1973 or project how much industry will spend in 1983? If the "growth" industries are "measurement intensive", is there a casual relationship?
The importance of measurement and measurement standards to industry is frequently taken for granted. Measurement and measurement standards are used to:

- Eliminate Over-Design
- Permit Interchangeability
- Ensure Compatibility
- Assure Agreement Between Buyer and Seller
- Eliminate Producing by Trial and Error
- Predict Failure
- Protect from Hazards
- Produce in Practice What is Possible in Principle
- Publish Correct Data
- Provide Foundation for Scientific Advance
- Monitor Performance
- Provide System Control.

NBS is presently increasing its effort in studying the system and hopefully enlisting help from as many segments of the system as possible to gauge the changing scope and infrastructure of the National Measurement System.

The Board of Directors of NCSL has agreed to assist NBS in their study wherever possible. It is obvious that the more the member laboratories know about the total system, the more effective they can be in their own planning and resource allocation.

A rather interesting change has taken place relative to resource allocation in the United States. In 1964, 3.04% of our GNP was applied toward research and development. In 1972, only 2.41% of our GNP was directed at research and development. During this same time period, the general public has shifted from pride in our technological achievement to a certain amount of distrust of technology. The members of the technological community have failed to communicate the significance and value of their work to the general public. Why? In some cases this is because they did not know the significance or potential impact of their work. They failed to integrate their role in the various social-economic systems. In today’s complex society, it is easier to see the impact of a total system than some individual contributions. Are the decision makers in your parent organization aware of the significance and economic dimensions of measurement activity in U.S. industry and commerce? Have you failed to communicate the value and need for accurate and transferable measurement? Have you given it sufficient thought, yourself?

It is important to the members of NCSL to know the economic dimensions of our own professional organization. How many dollars do our parent organizations spend just to maintain the capability to perform accurate, transferable measurements? What is the size of economy on which the member laboratories impact? We are now trying to assemble this type of data. The member laboratories will be receiving requests for this type of information. As this data is processed and assembled, it will be presented to the NCSL membership. The economic dimension of NCSL will surprise some of the membership and, I am sure, help the parent organizations understand the important and complex role of the various standard laboratories.
DR. ROBERTS NAMED NEW NBS DIRECTOR

Dr. Richard W. Roberts has been installed as the seventh Director of the National Bureau of Standards.

Roberts comes to the National Bureau of Standards from the General Electric Research and Development Center in Schenectady, New York. The 38-year-old industrial scientist is the first chemist to head the Bureau since its establishment in 1901. He was selected by President Nixon to succeed Dr. Lewis M. Branscomb who resigned in May of 1972.

At the GE R&D Center, Roberts was Research and Development Manager of Materials Science and Engineering which included four Laboratories (Chemical, Materials Science and Engineering, Metallurgy and Ceramics, and Physical Chemistry) with a combined staff of more than 250 scientists and engineers. Under his leadership the Laboratories achieved many important technological advances, including the first gem quality man-made diamonds; unique machining tools for space-age metals and alloys; new composite materials; a revolutionary solid-waste recycling process; the world's most powerful permanent magnets; and significant progress in coal gasification research, which is aimed at making coal a clean fuel.

At NBS, Dr. Roberts will direct the activities of about 3500 employees, almost half of whom are scientists, mathematicians or engineers.

The Bureau, as the nation's measurement laboratory, is responsible for maintaining and improving our national standards of measurement. As measurement touches nearly every human activity, the Bureau conducts research in many fields, including environmental protection, building technology, urban problems, atomic science, computer science and technology, law enforcement standards, product safety, electronic technology, engineering standards, and the application of technology to many national programs. NBS also participates in the activities of international standardization organizations, which are of great importance to the success of U. S. foreign commerce and international scientific cooperation.

A native of Buffalo, New York, Roberts received his bachelor's degree with distinction (1956) from the University of Rochester, and his doctorate in physical chemistry (1959) from Brown University. He served as a National Academy of Sciences Postdoctoral Fellow at NBS prior to joining the GE Research Laboratory (now part of the R&D Center) in 1960.

As a research scientist, Roberts became internationally known for his studies of ultra-high vacuum technology, the physical and chemical properties of atomically clean metal and semi-conductor surfaces, chemical kinetics, and the lubrication of space-age metals. He played a major role in the development of a new family of lubricants that make it possible to use titanium, stainless steel, and other "unlubricable" materials for the moving parts in machines of the future.

In 1965, Dr. Roberts began his career in technical management as Manager of the Center's Structures and Reactions Branch. In 1968, he was appointed Manager of the Center's Physical Chemistry Laboratory, responsible for programs involving electrochemistry, superpressure research, Inorganic structures and reactions, life sciences, and surface chemistry and physics. Late in 1968, he became Manager of Materials Science and Engineering.
NEW NBS DIRECTOR - continued

Holder of two patents, Roberts is the author or co-author of more than 70 technical publications, and co-author of the book, Ultra-high Vacuum and its Applications.

He is a member of the American Chemical Society, the American Physical Society, the New York Academy of Sciences, the American Nuclear Society, the American Association for the Advancement of Science, and Sigma Xi. He is a senior member of the American Vacuum Society, a Fellow of the American Institute of Chemists, and Associate Editor of the Annual Review of Materials Science.
Dr. David T. Goldman, nuclear physicist and program analyst, has been named Deputy Director for the Institute for Basic Standards at the National Bureau of Standards, U. S. Department of Commerce. He succeeds Dr. Robert J. Corruccini, who retired on December 29, 1972.

IBS provides the United States with a central basis for a consistent system of physical measurement; coordinates that system with measurement systems of other countries; and furnishes essential services to the nation's scientific and technological community. Dr. Goldman's new responsibilities include assisting IBS Director Ernest Ambler in program planning and evaluation, policy formulation, and allocation of resources.

Dr. Goldman joined the Bureau in 1965 as Chief of Theoretical Physics in the Reactor Radiation Laboratory, Institute for Materials Research, a post he held until 1970. He directed theoretical analysis of nuclear data and problems, and of atomic and molecular structures and the interaction of low-energy neutrons with matter. During the same period (1965-1970), he also served as Nuclear Data Program Manager in the NBS Office of Standard Reference Data. From 1969-1970, he was on detail to the Executive Office of the President, Office of Management and Budget, as a Department of Commerce Science Fellow. In 1970 he was named Program Analyst in the Office of the Associate Director for Programs, and remained in that post until his current appointment as Institute Deputy Director.
Born in Brooklyn, New York, Dr. Goldman was educated at Brooklyn College (B.A. cum laude physics, 1952), Vanderbilt University (M.S. physics, 1954), and the University of Maryland (Ph.D. physics, 1958). During 1953-54, the Atomic Energy Commission granted him a Radiological Physics Fellowship. From 1958-1959, he was a Research Associate at the University of Pennsylvania investigating the many-body theory of nuclear matter. During his graduate study years, he spent several summers at Oak Ridge National Laboratory studying theoretical problems associated with the containment of a plasma for thermonuclear power. From 1959 until he joined the staff of NBS, he was a Supervising Physicist in nuclear methods development at General Electric's Knolls Atomic Power Laboratory.

Author of over 60 technical publications, Dr. Goldman is a Fellow of the American Physical Society, and has been active in the American National Standards Institute and the International Standards Organization since 1969. He was the first Chairman of the Reactor Physics Division of the American Nuclear Society (1964-1967). He is adjunct Professor in Nuclear Engineering at the University of Maryland, where he is presently teaching a course in technology assessment.

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Dr. James R. Seed, on leave from the Dow Chemical Co., has accepted an appointment as NBS Scientific Assistant to Dr. Ernest Ambler, Director of the Institute for Basic Standards. Dr. Seed is a "Presidential Interchange Executive." The President's Interchange Program allows middle managers from industry with high career potential to obtain experience in the public sector. High potential candidates from civil service, in turn, are given assignments in industry for from 12 to 24 months.

Assigned to coordinate a comprehensive examination of the National Measurement System, Dr. Seed will direct a structural and economic study of the Bureau's role in the system. The task involves a technological assessment of IBS efforts at providing the basis for coordinating and servicing the National Measurement System (NMS).

A graduate of Sacramento State College in California (B.S., Chemistry), Dr. Seed received his Ph.D. in Physical Chemistry from the University of California. Society memberships include: ANSI, ACS, Sigma Xi, the Research Society of America, and the Health Physics Society.
The State of California Measuring System (SCMS) was formally launched in January when William F. Cowan, Chief Deputy Director of the California Department of Food and Agriculture, presented Certificates of Participation to the four initial participating laboratories: Los Angeles County, Rockwell International Autonetics Division, Santa Clara County, and Lockheed Missiles and Space Company. This action culminates several years of work on the part of State, County, NBS, Education, and Industry representatives. The system is the first of its kind in the country.

SCMS is designed to provide industrial, academic, and governmental organizations within the State of California a source of calibration and certification services traceable to NBS. Agencies which utilize the system will save a substantial portion of the time and expense of sending their standards to NBS and in many cases will eliminate the necessity of having duplicate or triplicate sets of standards. At present, the system is set up only in the two disciplines of mass and length, but other disciplines and other laboratories will be added after the mechanics of system operation are smoothed out. The primary activity of the Santa Clara and Los Angeles County Laboratories is service to other counties and State regulatory agencies, whereas the primary activity of Autonetics and Lockheed will be service to industry and Federal agencies.

State of California
DEPARTMENT OF FOOD AND AGRICULTURE
METROLOGY ADVISORY COMMITTEE

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Department of Food and Agriculture
Sacramento
WILLIAM F. COWAN (center), Chief Deputy Director of the California Department of Agriculture, presents plaque certifying Lockheed Missiles & Space Co., (LMSC) measuring laboratories. LMSC President S.W. Burriss (right), accepts the plaque. At left is Walter Hurd, Jr., Manager of Space Systems Division (SSD) Product Assurance, and a member of the California Metrology Advisory Committee.

On Friday, January 19, 1973, Mr. Walter S. Watson (right), Chief of the California Bureau of Weights and Measures, presented the official certification of Autonetics' participation in the State of California Measurement System to J. Dave Mitchell (left), Metrology Manager.

Our thanks to Don Greb of Lockheed Missiles & Space Co., Inc. and Dave Mitchell of Autonetics Div., Rockwell International, for this fine article on the State of California Measurement System.
In Apollo we've been to the Moon nine times, and during those nine trips to the Moon there's been six landings. During the course of the six landings, our astronauts spent 166 hours - man hours - outside the lunar module on the surface of the Moon. They traversed 96 kilometers on the lunar surface. They brought back 385 kilograms of lunar material. They placed six scientific stations on the Moon. Five of them are still working actively, and of course, the sixth has a laser reflector that is also still being used. They left no less than sixty major scientific experiments on the Moon, most of which are major experiments in lunar orbit.

Skylab, America's first space station, will be launched May 14 from Cape Kennedy, Florida. The experimental orbital workshop consisting of a 100-ton laboratory complex in which medical, scientific, and technological tests will be performed will be rocketed into orbit about 270 miles above Earth at 1:30 p.m. (EST). The next day, May 15, the first Skylab crew will be launched aboard an Apollo spacecraft. The prize crew will be Astronaut Charles Conrad, Jr., commander; Scientist-Astronaut Joseph P. Kerwin, science pilot; and Astronaut Paul J. Weitz, pilot. They will rendezvous and dock with the orbital workshop and remain in space 28 days.

The astronauts will use their Apollo craft to return to Earth on June 12. The orbital workshop will remain whirling around the Earth, awaiting two more crews. The second crew, which will attempt a 56-day mission, is now scheduled to be launched Aug. 8 and return Oct. 3. The third mission, also 56-days, is ticketed to lift off Nov. 9 and return Jan. 4, 1974.

The Skylab I emblem, designed by artist Kelly Freas, shows the Skylab silhouetted against the Earth's globe, which in turn is eclipsing the Sun —- showing the brilliant signet-ring pattern of the instant before eclipse.
COMMENTS ABOUT O.S.H.A.

The administration of the Occupational Safety and Health Act (O.S.H.A.) is assigned to the Department of Labor under an Assistant Secretary. This act also established the National Institute of Occupational Safety and Health (N.I.O.S.H.) which is a part of the Health, Education and Welfare Department. NIOSH has the responsibility for research and the recommendation of safety and health standards. Initially, existing standards in government and industry have been adopted along with nationally accepted standards from professional societies and manufacturers' associations. The act applies to "every employer in business affecting commerce who has employees". Eventually, each state is to assume the direction and enforcement of the act with the Secretary of Labor approval.

Each employer has the duty to comply with O.S.H.A. and to provide working conditions free from hazards likely to cause death or serious physical harm. Each employee has the duty to comply with the rules and regulations of the Act. Enforcement is by inspection of OSHA representatives with monetary and imprisonment penalties against the employer for violations. Fines up to $10,000 and 6 months imprisonment for willful violations, doubled for a second conviction, are prescribed. Any citation can be contested within 15 days, a hearing obtained before the Review Commission with appeals in U.S. Court of Appeals. Proposed standards are published in the Federal Register and can be challenged within a 60 day period. Variances can be granted.

Some industries with high injury records or those involved with substances recognized as health hazards are designated as target industries. These are receiving the immediate attention preceded only by - (1) investigation of fatalities and catastrophes; (2) employee complaints. After these, there is a random sampling of other businesses. Inspections are made without prior notice, records will be examined and physical inspection of any work areas. Violations noted are subject to immediate citation, penalties may be issued after consultation. Records and reports are required on all work-related deaths, injuries and illnesses which involve medical treatment, loss of consciousness, restriction of work or motion, or transfer to another job. Employees exposed to potentially harmful conditions may require medical examinations. Through July, 1972, it has been reported that 38,000 inspections resulted in 27,000 citations with proposed penalties of nearly $2.7 million. Just under half of the inspections have resulted in penalties.

NCSL members have an interest in the standards. Typical of the areas covered are noise, lighting, machinery guarding, welding, compressed gases, electromagnetic and ionizing radiation, toxic substances and general good housekeeping and safety rules. Present lists of toxic substances contain 15,000 items with standards set for 450 or so. Another area, noise, has 129 standards concerning ratings and measurements issued by 26 different organizations. Now add to these the noise standards concerned with medical treatment and physiological effects with an equal number of interested organizations and one can see the enormous problem of determining good standards. Certainly this is a field in which the expertise of NCSL members can make a substantial contribution.

Contributed by Lewis R. Wears of Johns Hopkins University
For over fifty years, saturated standard cell users sent their cells to the NBS for calibration. These cells were not ovenated and not shippable. Hence, there were long delays in waiting for stabilization at the Bureau, and later at the user's plant after return. Also, the special messengers required to handcarry the cells greatly increased the expense. Worse yet, there was no assurance that the cells recovered without offset due to temperature-time hysteresis. Also, matching the NBS temperature of calibration closer than 0.01°C was difficult or impossible.

The first improvement in this situation was the advent of air baths which could be kept at nearly constant temperature by running them on batteries while out of a laboratory. This greatly reduced the stabilization times and also minimized the temperature measurement problem. However, the costly messenger and the doubt about full recovery remained.

The next improvement was the use of shippable cells to eliminate the messenger and reduce costs.

But to prove that the user had no important systematic errors, a different approach was required. The NBS was working on the general problem of "closing the measurement loop" in the early '60's; their general approach is the "Measurement Assurance Program" (MAP). Their first customer service under MAP was the Mass Pilot Program announced in 1966. (See NBS Technical Note 288 of May 6, 1966). About this time, Newark Air Force Station required greater voltage accuracy, and set up a lengthy program of closing the loop by repeated transports of cells to the Bureau. (See Eicke, Belicki, and Cameron, "Interlaboratory Transfer of the Unit of Voltage", ISA Trans., October 1968.)
In 1970, NBS initiated their Volt Transfer Program (VTFT). In this, the Bureau calibrates a set of its own portable standard cells in an air bath that can be operated from nickel-cadmium storage cells in an accessory package containing a trickle charger. The Bureau then ships this Transport Standard to the customer, who then transfers the volt to his Reference Cells, and returns the Transport Standard to the NBS, where it is recalibrated. All data, including the customer's, is processed by the NBS. Now, if the Bureau is satisfied with all results, including the customer's procedure in detail, the Bureau will issue a test report to the customer, generally with an accuracy assignment of 1 ppm.

Even VTFT has drawbacks. If the customer utilizes it only at one- or two-year intervals, he can be in trouble a long time, perhaps without knowing it. If he uses VTFT frequently, the NBS fees become expensive. Also, if he had too many loose ends, he would not get the 1-ppm accuracy statement the first time through VTFT.

In 1970, five company metrology laboratories that are geographically close, joined forces to improve on the Volt Transfer Program and still keep costs reasonable. This cooperative approach is the Southern California Standard Cell Interchange Program (SCSCIP). In this program, one laboratory is selected to be the "pivot laboratory". The other four laboratories and the NBS measure their Transport Standard Cells, all data reduction being done by the NBS. After any known problems are resolved, the five Transport Standards are sent to the pivot laboratory, under battery power. The pivot laboratory intercompares its own Reference Standard cells and the four industrial Transfer Standards with the Bureau's cells, sending all data to NBS for processing. After resolving any problems, all Transport Standards return to their owners for recalibration. After all results are known, and no problems remain, the Bureau normally issues a test report, assigning an accuracy of about 1 ppm to the mean of the Reference Standard cells of each participant.

The SCSCIP is advantageous in several ways. One, any laboratory having or suspecting trouble can interchange cells with another laboratory as part of or entirely separate from the current SCSCIP, to aid the trouble shooting. The total duration of the measurements is at least six weeks, so that there is much greater opportunity to detect unstable cells than in the usual two-week series of measurements in the VTFT. The NBS fees are under $300 for each participating laboratory. Finally, any laboratory experiencing a catastrophic failure of its voltage standard could recover rapidly with the aid of the other participants.

The third SCSCIP has just been completed successfully for all five participants. The problems and errors were fewer and milder, so that each laboratory received a good report. For example, all participants were within ±0.25 ppm of the NBS-Volt and other known systematic errors were negligible. Also, the three-sigma random error of the mean of the Reference Standard cells was <0.6 ppm in all cases. All participants are pleased with SCSCIP, and expect to continue it, gradually reducing the frequency to once per year or less.

This article was contributed by Frank Woodsmall of Autonetics; he is a member of the NCSL Measurement Assurance Committee.
In order to provide cost effective measurement surveillance of machinists' personally-owned hand tools, it was decided that a special Measurement Assurance Program (MAP) could be set up which would check not only the tools but also the machinists' ability to measure accurately. A special verification gage was designed with gaging surfaces representing typical part configurations. Measurements of the established gage dimensions test the normal failure mode of the various measurement hand tools and the measurement skills of the machinist. The dimensions of the verification gage are adjusted between surveys so that the actual values are unknown to the machinist.

Periodically, machine shops are surveyed and each machinist brings his tools to a checking station where he measures the dimensions of the verification gage. The skill required to perform accurate measurement and the gage's odd shape prompted machinists to name it "the pretzel". Measured values are recorded by the individual machinist and following completion of testing in the shop area, these values are compared with the known dimensions of the gage. Tolerances have been established which are compatible with normal shop requirements and out of tolerance tools are reported to shop supervision for corrective action.

This Hand Tool Verification Program has proven to be very beneficial. At the conception of the program, it was decided that the verification of each shop area would be completed every six months. Four percent of the tools originally tested were found to be out-of-tolerance. After several verification periods, the number of out-of-tolerance tools was reduced to less than 0.5% and the period was subsequently increased to one year. A significant cost saving was realized from the use of this Measurement Assurance Program rather than conventional techniques.

Although it has always been recognized that part of the machinists' job is to calibrate his personally owned measurement hand tools "on use" using gage blocks and ring gages, the Hand Tool MAP program has brought increased attention to the proper use and maintenance of measurement hand tools.
For almost thirty years, there has been a very viable Navy Calibration/Measurement program at NAS North Island, San Diego, California. In November 1960, this calibration effort was formally re-identified through the establishment of the Western Standards Laboratory (WSL) - one of two Navy Type I Standards Laboratories, technically geared directly to the National Bureau of Standards.

WSL provides all of the Type I calibration support service west of the Mississippi, including many Pacific overseas installations and commands. This support embraces Navy Air, Ordnance, Electronics, and Ships Systems Command activities; Marine Corps, DOD contractors, FBM program, Navy R&D and other miscellaneous activities. The Type I Laboratories maintain "parent" calibration standard responsibility for eight Standards (Type II) Laboratories, 90 Calibration Laboratories and 126 Test Equipment Level I calibration activities. Approximately 300 contractor Standards Laboratories are also served.

Primary emphasis, of course, is placed on the accuracy, compatibility, correlation and interchangeability of test and measurement equipment/systems in all areas under the cognizance of the WSL. The WSL calibration program is intimately involved with measurement disciplines in the following categories:

<table>
<thead>
<tr>
<th>Mass</th>
<th>Volume</th>
<th>Electrical</th>
<th>Capacitance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Force</td>
<td>Acceleration</td>
<td>Electronic</td>
<td>Impedance</td>
</tr>
<tr>
<td>Temperature</td>
<td>Viscosity</td>
<td>Inductance</td>
<td>Pressure (vacuum)</td>
</tr>
<tr>
<td>Humidity</td>
<td>Flow*</td>
<td>Magnetics</td>
<td>Phase</td>
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<tr>
<td>Dimensional</td>
<td>Acoustics</td>
<td>Radiation</td>
<td>Resistance</td>
</tr>
<tr>
<td>Optics</td>
<td>Hardness</td>
<td>Attenuation</td>
<td>Specific gravity</td>
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<tr>
<td>Frequency</td>
<td>Infrared</td>
<td>Photometry</td>
<td>Power</td>
</tr>
<tr>
<td>Noise</td>
<td>Voltage</td>
<td>Interferometry</td>
<td>Surface finish</td>
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(* WSL has one of the best Flow Measurement facilities in the United States.)

From a workload standpoint, between 4000 and 5000 standards are calibrated annually by some 40 WSL laboratory personnel - primarily highly skilled professional engineers and engineering technicians. Additionally, equipment acceptance tests, special measurements, measurement training/consultation services, and engineering report preparation are accomplished by these WSL metrology people.

Much of the WSL effectiveness and ability to respond to customer and Fleet needs derives from the innovative use of advanced data processing management information systems. This recognition of new computer concepts, i.e., "On-line" visibility of WSL workload progress, statistical data reduction and automated scheduled recall of test equipment, has enabled WSL to advance to the forefront in the calibration/measurement field.
WESTERN STANDARDS LABORATORY - continued

The Western Standards Laboratory of the Naval Air Rework Facility, North Island, is justifiably proud of its many contributions to the national metrology picture. Similarly, other calibration and measurement laboratories have played major roles in developing a climate of outstanding professional expertise with respect to the overall U. S. metrology program.

All of the above calibration facilities and people reflect a vested scholarship of progressive community achievement which is highly laudable. The Western Standards Laboratory feels privileged to be a significant participative contributor in the national technical measurement arena. It is a continuing goal of WSL to optimize its endeavors in the direction of further improved metrology procedures and concepts.

The Editor would like to thank Larry Becht, Head of Western Standards Laboratory, for this fine article.
A paper authored by Jack Hall of Autonetics' Metrology Laboratory, was presented at the National Bureau of Standards' October Dimensional Accuracy Conference at Gaithersburg. The conference included industrial applications for Measurement Assurance Program (MAP) in dimensional disciplines. The Autonetics Division of Rockwell International, has long made use of a variety of measurement assurance programs in dimensional measurement problem solution. Many of these Measurement Assurance Programs were developed to support the fabrication and inspection of parts for spherical gas bearing gyros used in guidance systems for major weapon programs. These programs demand dimensional accuracy in the 1 to 2 microinch realm.

One Length Measurement Assurance Program (LMAP) developed at Autonetics, was of particular interest to participants of the conference and created considerable discussion. Briefly, the program makes it possible for Autonetics to approach one-microinch NBS length calibration on gage blocks within the zero to two-inch range. The measuring system utilizes a Link Fringecount Interferometer functioning in a long range (0-2 inches) highly sensitive comparator mode. Typical performance of the system is statistically controlled using five special test gage blocks whose lengths are intercompared. Only one gage block is sent to NBS for their best measurement. Dr. John Simpson, Deputy Chief of the Optical Physics Division of the Institute for Basic Standards, expressed concurring views in the panel discussion and indicated that both NBS and the National Physical Laboratory of England are developing LMAP systems that work the same way.

Autonetics Metrology's new role as an official laboratory in the State of California Measurement System (SCMS) for length and mass and the numerous requests for reference level dimensional calibrations/measurements to support other Rockwell International, products, prompts Autonetics to consider LMAP's no less than a healthy way of life. Jack Hall's presentation at the conference was effectively a demonstration of what is needed and being accomplished locally with MAP concepts. It also asks other laboratories in industry with similar demanding length measurement problems to join in developing and extending LMAP on a national scale for mutual economical benefit.

Additional information and/or questions related to this program should be directed to J. D. Mitchell at 714-632-2685.
UPCOMING MEETINGS

"LOW FREQUENCY ELECTRICAL MEASUREMENT SEMINAR"  - April 30 - May 3, 1973
N.B.S. (Gaithersburg, Maryland)  Fee: $200

1973 ELECTRICAL & ELECTRONIC MEASUREMENT & TEST INSTRUMENT CONFERENCE
Ottawa, CANADA  1973 EEMIC  May 15-17, 1973

NCSL REGIONS 6 & 7 MEETING
Radiation, Inc., Melbourne, Florida  May 16, 1973

NCSL BOARD OF DIRECTORS MEETING
Patrick Air Force Base  Cocoa Beach, Florida  May 17-18, 1973

"PLANNING FOR METRIC CONVERSION IN THE ELECTRICAL & ELECTRONIC INDUSTRIES"

1973 IEEE C-MIT INTERNATIONAL MICROWAVE SYMPOSIUM
"MICROWAVE APPLICATIONS IN THE 70's"
University of Colorado  Boulder, Colorado  June 4-6, 1973

"CALIBRATION AND USE OF PISTON GAGES"  Seminar - Upon Request
N.B.S. (Gaithersburg, Maryland)  Fee: $85  2-days
Apply to: Dr. Peter L. Heydemann - Tel. 301-921-2121

1973 - 28th ISA ANNUAL CONFERENCE & EXHIBIT
Astrobahll  Houston, Texas  October 15-18, 1973

1973 NCSL STANDARDS LABORATORY CONFERENCE
N.B.S. (Gaithersburg, Maryland) A. J. Woodington, Conf. Chairman  November 13-16, 1973

2nd JOINT CONFERENCE ON THE SENSING OF ENVIRONMENTAL POLLUTANTS
Sheraton-Park Hotel  Washington, D.C.  December 10-12, 1973
Sponsors: American Chemical Society, American Meteorological Society, American Institute of Aeronautics & Astronautics, Institute of Electrical & Electronics Engineers

1974 CONFERENCE ON PRECISION ELECTROMAGNETIC MEASUREMENTS (1974 CPEM)
London, England  July 1-5, 1974