A NEW FACE

This issue of the Newsletter presents some small departures from the routine pattern. First, the request for assistance in compiling the contents has been answered from two quarters. On the East Coast, I am indebted to a small group coordinated by Frank Sciacchitano who collaborated in producing the article entitled "Shock and Vibration of Standard Cells". On the West Coast, Dick Ernst put together some local news while getting organized for wider coverage. My deepest thanks to them and a suggestion to readers that they assist these two men with more articles and news items. By the way, glossy photographs approximately 3½x5 inches are most welcome in any aspects of measurements engineering.

The second departure was to reduce our type size to carry more "bits per page". Our method of printing permits faster service if no reduction process is involved, so we found it necessary to print the mushrooming contents on a smaller scale, in order to keep mailing costs reasonably in hand. We hope you older readers won't mind. Third, to make up for the lack of illustrations and to relieve the monotony of plain reading material, we went back into our files to retrieve some of the original-issue cartoons which were so readily accepted by readers. There has been such a turn over in readers that the chances are many have not seen them and will enjoy a bit of lightness. Older readers are reminded that we wouldn't have to repeat cartoons if they would make up some of their own! How about it?

There is no special message from the NCSL Chairman, since much of what is happening presently is preparation for the Board of Directors Meeting in New York on March 19. Besides, Past Chairman VAN DEHOUTEN did such an excellent job on his Annual Report, anything the present Chairman would say would be anticlimatic. Your attention is directed to page 5.
So spoke Ted Saad in an editorial in the Microwave Journal, November 1966. It was a clear, loud shout to the self-contented, the lazy, and the complacent ones. Here are some excerpts:

"The number of hours that we can devote to reading technical literature, attending professional meetings and visiting trade shows is severely limited. Because of today's demands, some of us feel obliged to minimize the time devoted to this type of activity. Is this wise? I think not. It is important to our own professional growth that we continue reading the literature, attending the meetings, and visiting the trade shows. Some engineers take pride in stating that they do not receive any technical literature, they do not join any societies, they do not attend any meetings. I admire their independence, but I am forced to assume they are working in a vacuum.

When an engineer graduates and goes into industry, unless he continues his formal education by taking advanced courses, his only recourse to avoid obsolescence is through communication with people in his area of technical interest. The technology, as we know, is moving rapidly and in many directions at the same time. Only minds that are far more active than most of ours would be capable of keeping up with the technology while working in a vacuum. The rest of us have to add to our information by piecing together those fragments that we acquire from the literature, from discussions, and from exhibitions.

This is not to imply that one should read all of the published literature or attend all of the technical meetings, or join all of the professional societies, or visit all of the trade shows. There is not enough time available. However, it is important for the continued education of an engineer that he expose himself to certain technical publications on a regular basis, that he attend some of the meetings of his professional society, and, if possible, that he attend at least one trade show during the year. Not only will this help him maintain his technical competence and knowledge, but also it will help him understand the industry that he is in; thereby enhancing his and its growth.

Why read the microwave journal? Why join the MTT? Why go to the IEEE Convention or WESCON? The answer is very simple. If we don't do it, when the manpower shortage is over, someone who has will come along and take our job away. Only a genius can maintain his technical competence and knowledge without the aid of outside information. The rest of us need help.

NBS TRAINING AT BOULDER

Announcement has been made of a three-day seminar on Phase Shift at the Radio Standards Laboratory, NBS Institute for Basic Standards, at Boulder June 7-9, to be repeated June 12-14. Concurrently the Laboratory will present a three-day seminar on High Frequency Voltage. Attendees are able to attend both
seminars if desired, by registering for consecutive periods. More information is available by writing to the Radio Standards Engineering Division - NBS/IBS, Boulder, Colo. 80307.

The period August 7-18 will see another course presented by the Radio Standards Laboratory in Electromagnetic Measurements and Standards. Registration forms are available from the Bureau of Continuation Education, University Memorial Center, University of Colorado, Boulder, Colorado.

AMERICAN ORDNANCE ASSOCIATION PROGRAM

The Standards and Metrology Division of AOA will hold its Twenty-first annual meeting in Gaithersburg, Maryland on April 12-13, with H. J. BOPPEL and J. K. EMERY as chief planners. Host will be the National Bureau of Standards. Some topics will be "The NASA Measuring System" by Dr. E. MECHTLY of the University of Illinois, "The Standards Laboratory as an Element in the National Measurement System", by J. R. VAN DEHOUTEN of Aerojet-General; Workshop sessions will be on Surface Texture, Measurement of Ultra-fine Surface Finishes, Influence of Surface Texture in Length Interferometry, Industrial Laser Positioning Applications, in the mechanical field. In the general physical standards field, workshops will be conducted on Aerospace Fluid Flow Metrology, Error Sources in Azimuth Determination, and Thermal Coefficient of Expansion Standards, while the new Redstone Arsenal Metrology Laboratory will be described by DON HERWIG. Contributors to the Workshops are J. P. CHAMBERLAIN, J. C. MOODY, R. W. SCHEDE, T. R. YOUNG, F. L. HERMACH, R. L. GALLEY, K. J. LUND, and R. K. KIRBY.

INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS


During the week numerous committee meetings involving NCSL people will be taking place. These include the IEEE Instrumentation and Measurement Group Administrative Committee, the Subcommittee on Pulse Definitions, the Technical Committees on Low Frequency Instruments and Measurements, High Frequency Instruments and Measurements, Fundamental Standards, Materials Measurements, Electromagnetic Measurements State of the Art, Oscilloscopes, and the USAIS Committee C-100 on Electrical Standards.

IEEE has honored Dr. W. G. AMEY of Leeds & Northrup by conferring upon him Fellow membership. The citation stated "For valuable contributions to the field of basic electrical measurements, and as a director of research in this field". Congratulations, Bill! Also honored are two men from the NBS-Boulder Laboratories who are well known to many of us. I refer to Dr. H. M. ALTISCHULER, and R. W. BEATTY.
STATISTICAL CONTROL OF MEASUREMENTS

Statistical analysis of measurement errors has become an additional tool of metrologists and is being used in an increasing number of applications and at an increasing rate in order to determine numerically the accuracy of measurements and the confidence attached to quoted accuracies. Methods of evaluating random errors are becoming widely known; a fair amount of existing literature on this topic is being supplemented by a mounting number of articles and papers in trade publications. The literature deals very extensively with the treatment of random errors. Systematic errors receive a few passing remarks if they are mentioned at all.

Mr. ROLF SCHUMACHER of Autonetics Metrology Laboratory has prepared a paper which discusses the nature and origin of systematic errors. By means of examples, it is shown that a random error under one set of conditions may be considered a systematic error under another set of conditions and vice versa. Recommendations are made concerning the assignment of values and limits of uncertainties to laboratory standards. Specific methods are described for keeping standards and measurements in a standards laboratory under control.

Valuable contributions to Schumacher's paper were provided by several NBS personnel, including members of the Statistical Engineering Laboratory. The paper has been submitted to the Editorial Department of the IEEE for their consideration and possible publication. If not published in IEEE Transactions, copies will eventually be made available through Autonetics Public Relations Department. Watch the NCSL Newsletter for further details.

INSTRUMENT MAINTENANCE OPTIMIZATION

"Instrument Maintenance Optimization" is the theme for the Second Annual National ISA Instrument Maintenance Management Symposium to be held April 24-26, 1967, at the Sheraton-Lincoln Hotel in Houston, Texas. Nearly all of the sessions will be of interest to standards laboratory management. Topics will include: organization, maintenance systems, training, maintenance costs, personnel selection, accuracy criteria, etc.

SYSTEMS CALIBRATION AND SERVICE

System calibration and/or service can eliminate disassembly, shipping to and from the laboratory, and reassembly of individual components. The philosophy and implementing details of a Systems Calibration and Service Program are described in Audio-Visual Programs developed by the Space and Information Systems Division of North American Aviation, Inc. If you are interested in receiving copies, contact P. A. JOESCHKE, Department 047, S&ID, 12214 Lakewood Boulevard, Downey, California 90241.

(Contributed by R. ERNST)
The accomplishments of the past year are a tribute to NCSL's Board of Directors and Committee Chairmen. To each of them I wish to express my deepest thanks and appreciation. Acknowledgement must be given also to the many other persons who contributed their time and effort for the benefit of NCSL - especially to the members of the NBS staff who have been ever willing to respond to a request for help.

It is with deep personal regret that I mention the Board of Directors was one member shy at the end of the year, due to the death of Walter Hunter. I, along with many NCSL members and his associates at the Sandia Corporation, valued his friendship. His absence will be felt for a long time to come.

The new NCSL Officers and Board of Directors for 1967 officially assumed office on October 25, 1966. (Their names were included in the December Newsletter.)

The unquestioned highlight of the past year was the success of the 1966 Standards Laboratory Conference at the new NBS Laboratories in Gaithersburg, Maryland. There were, of course, many other activities and significant accomplishments during the past year. Those I feel most important are summarized in this report.

No detailed summary of committee activities is included, as their activities, status, and future plans were covered in detail during the Gaithersburg Conference. The Conference Proceedings are scheduled to go to the printer on January 13 and should be available in the middle of March. All attendees of the Conference will automatically receive copies. Additional copies can be procured from the Government Printing Office, by ordering NBS Miscellaneous Publication No. 291.

In conclusion, I would like to reiterate my gratitude for having had the opportunity to serve as Chairman during the past year. It has been a very rewarding experience with many challenges and no more frustrations that could be anticipated. I hope I have been able to contribute as much to the future of NCSL as it has to me.

Sincerely,

John R. VandeHouten

EDITED VERSION OF REPORT HIGHLIGHTS

The membership continued to increase during 1966. As of September 30, 1966 there were 146 paid members (153 as of January 10, 1967). Only two organizations declared they would not continue their membership.

At the end of the year the treasury had a small increase over the previous year-end total. During the year the Board of Directors officially established NCSL's fiscal year as July 1 through June 30 to coincide with the membership year.

Liaison has been established with a number of organizations whose interest are closely allied with those of NCSL. It is NCSL's intent to cooperate as closely as possible with all such organizations and to avoid duplication of effort. The liaison delegate is NCSL's primary means of communication with these groups.
Official liaison was established with two additional technical societies during the year and liaison delegates were appointed. These were the Institute of Environmental Sciences and the Precision Measurement Association.

A significant extension of the liaison concept resulted in the invitation and subsequent designation of two liaison delegates from other countries: the British Calibration Service and Canada's Department of National Defence. It was recognized that a close relationship exists among standards laboratories throughout the world and that improved communication is essential. The common interests were apparent to those who attended the Gaithersburg meeting. All were captivated by the interest and friendliness of the representatives from other countries and the session on the "Unification of Industrial Measurements in Other Countries" was a highlight. Preliminary discussions were held by the Board of Directors and the Organization Committee, on establishing an even more appropriate and active relationship by establishing a category of membership for foreign affiliates.

Based on recommendations made by the Organization Committee the Board of Directors approved the establishment of 24 committees at the beginning of the elective year. Subsequently, a committee on "Procurement Regulations" was established in March 1966.

It is noted that the By-Laws limit the chairmanship of committees under normal conditions to members, sponsors, or liaison delegates. However, any person, regardless of organizational membership, who can materially contribute to committee activities can be appointed to serve as a committee member.

During the year, the most significant change to the NCSL By-Laws was an increase in the number and length of term of the Vice Chairmen. Beginning with the newly elected officers for 1967 there will be four Vice Chairmen who will be elected for two year terms. Initially, two will be elected for a one year term to permit staggered terms of office. The Board of Directors will elect one of the Vice Chairmen to serve as First Vice Chairman. Besides providing active experience to more member delegates, this will assist the Chairman in long-range planning and in coordinating the work of the various NCSL committees. The By-Laws had been amended earlier in the year to allow the Chairman to delegate certain coordination responsibilities to the various NCSL Directors.

The greatest personal disappointment during the year was the failure to have Congress designate a National Measurement Standards Week to coincide with the dedication of NBS's new Gaithersburg facilities. Congressman George P. Miller introduced a joint resolution into Congress, however the House Committee on the Judiciary failed to act on H.J. Res 1247. Nevertheless, considerable interest and publicity were achieved. Most important, the groundwork has been laid for a future effort. The idea is an excellent one which would greatly benefit all persons involved with measurement standards. I sincerely hope another effort will be made by NCSL in the near future and that a campaign to take advantage of such a week can be planned by all standards laboratories and manufacturers of measurement equipment.
It is indeed fortunate that the services of an organization such as NBS are available. Thus, a gradual transition is possible towards the day when the establishment of an official full-time NCSL office and staff is required. In the meantime it will simplify means for all interested persons to obtain information, by writing to the NCsl Secretariat - NBS/IBS Washington DC 20234.

The concept of a National Measurement System being developed by Dr. R. D. HUNTOON and the National Bureau of Standards, is not only a fascinating but extremely important one. Anyone in the measurement field should not only read Dr. Huntoon's presentations (see the Conference Proceedings) but should also study them several times, so that he may be able to intuitively apply portions of this concept to day-to-day activities.

The scope of the National Measurement System and the difficulties in any one group evaluating its many elements were recognized. In a memo to the NCsl Chairman, dated May 6, 1966, Dr. Huntoon and Mr. W. A. WILDHACK of NBS suggested that NCsl examine the "Role of an NCsl Laboratory in the National Measurement System." The first response to this request was coordinated by LLOYD WILSON of Sperry Gyroscope and NCsl Corresponding Secretary. A copy of Dr. Huntoon's memo was submitted to a number of the committee chairmen who in turn responded for their committees. These were collected in a preliminary report to the Board of Directors by Mr. Wilson.

A later report on this activity is scheduled for presentation during the American Ordnance Association, Standards and Metrology Division, Annual Meeting scheduled for April 12 and 13, 1967 at the NBS Gaithersburg Laboratories.

It is my firm belief that the field of Measurement Standards needs improved methods for establishing and agreeing on the best administrative and technical methods to be used. By the preparation of Recommended Practices, together with Tentative Recommended Practices and preliminary reports, NCsl can be of great assistance to all members. Recommended Practices, methods, etc. already prepared by other organizations must be utilized to the greatest extent possible. This coincidentally provides a long-range program and measure of goal attainment for the NCsl committees.

The Conference Proceedings contain a report by BILL HOLMES, General Dynamics/Electric Boat Division, Chairman of the Recommended Practices Committee. Most notable of his accomplishments has been the establishment of a definitive step-by-step program, including format requirements, for the preparation and publication of NCsl Recommended Practices.

Significantly, the first two drafts of Recommended Practices were submitted to the Recommended Practices Committee during October by the Workload Control Committee. These cover the establishment and adjustment of calibration intervals and operation of an instrument control system.

In May, Vice-Chairman ORVAL LINEBRINK of Battelle Memorial Instutue was requested to evaluate the assets of NCsl, and develop a long-range planning program. In the few months available, several interesting suggestions were submitted. The interim report submitted to the Chairman recommended that NCsl should consider future action to:
1. Better acquaint the general public with the general role and importance of measurements on our present and future technology.

2. Promote, through all levels of the schools, interest and understanding of the challenges and rewards in the field of metrology and standards.

3. Analyze the potential need and the steps necessary for establishing a permanent NCSL office staffed by an Executive Secretary.

This long-range planning is continuing and for years should be a major contributing factor in establishing those long-range goals and programs needed for NCSL's greatest effectiveness.

The Board of Directors endorsed the general recommendations submitted by A. J. Woodington, Chairman of the NCSL Program Committee:

1. To continue sponsoring a Standards Laboratory Conference every two years. The next one is to be held in 1968.

2. During the alternate years, at least two smaller meetings, such as past workshops, would be held. The locations of these would be selected on a geographic basis so that extensive travel would be minimized.

3. NCSL will continue to cooperate with other organizations in programming meetings, such as has been done with ISA. In particular, the various committees will be encouraged to participate in such meetings.

4. Other organizations will be requested to participate and assist NCSL in the alternate-year meetings.

The Calibration Procedures Library, with Don DeLauer of Vandenberg, AFB as chairman, continues to be one of the most-beneficial services offered to Member Laboratories by NCSL. A detailed report on this operation is included in the Conference Proceedings, but since the CPL is our principal expenditure, it warrants more than casual mention.

Most of the present 72 members have been actively taking advantage of the 22,648 line entries in the library. Although there are redundant and inadequate procedures, collectively they represent an abundance of pooled knowledge. Newly developed calibration techniques (and even some old ones), instead of being proprietary to a few individuals, are made available for the benefit of all members -- they should prove invaluable to any organization preparing calibration procedures for its own use. At Aerojet, for example, we have found many uses for these documents, and their use has resulted in an approved and validated cost reduction of $20,686 for 1966. And we now have more and better procedures than would have been possible otherwise. Other organizations have realized comparable savings, which more than offsets the cost to NCSL of $5,205.68, and to the Air Force for their generous assistance and use of their facilities. Improvements are still necessary, of course, and are continually being made in several areas.
To help offset the expense of the library to the NCSL, and in recognition of the cost savings to them resulting therefrom, the Navy is providing financial assistance through NBS. At the same time, NCSL has agreed to evaluate ways of improving the services provided and to take steps to make the library self-sustaining. The final report of this evaluation is due in June 1967.

The close ties between NCSL and the Measurement Standards Instrumentation Division (MESTIND) of the Instrument Society of America were again apparent during the 21st Annual ISA Conference and Exhibit in New York, October 1966. NCSL accepted MESTIND's invitation to assist in the programming of two sessions. One session, "Audit Package Results," was jointly programmed with MESTIND and the other, "NCSL Activities Report," was programmed by NCSL. SHELDON RICHARDSON, General Electric, Schenectady, and an NCSL Director, acted as program chairman for NCSL. As Chairman of NCSL's Measurement Comparison Committee he was also active in the presentation.

As has been our custom, a Board of Director's Meeting was scheduled for that week and was, in fact, selected as the time to officially turn over the reins to the new Board of Directors.

John R. van De Houten

NEW PUBLICATION

After a good deal of blood, sweat, and toil (metaphorically speaking) MILT MANSON has announced his new publication "Measurements & Data News". A drastic departure from prevailing magazines, it appears to have an interesting format, judged from the first issue just received. If by any chance you haven't received the descriptive brochure, you can inquire at 1001 East Entry Drive, Pittsburgh, Pa. 15216.

METRIC SYSTEM LEGISLATION

We are indebted to L. KUHN of AIA for news of identical bills (H.R. 3136, S. 441) submitted in Congress by Representative George Miller, Chairman of the House Committee on Science and Astronautics, and by Senator Claiborne Pell, to authorize the Secretary of Commerce to conduct studies to determine the impact of increased worldwide use of the metric system on the U.S., and on the practicability of increased use of the system in the U.S.

PLANNING A NEW STANDARDS LABORATORY?

We are indebted to HANK DANESMAN of Leeds & Northrup for some information concerning available brochures on the subject of equipping a Standards Laboratory. He has been most interested in inquiries to date which indicate deviation from the normally-considered supporters of laboratories. Aside from the usual complement of inquiries from aircraft and electronic plants, he has noted an increasing interest from industries involved in footwear, flat glass, non-ferrous foundries, drugs, railroad equipment, machinery distributors, medical R&D, abrasive products, etc. If interested, write H. C. Daneman, Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa. 19144.
The merit of four-engineering technology programs has kept opinions divided since the day this phenomenon began to show up in American institutions. Now there are some 70 such programs, and many in the engineering profession are still undecided whether to support them or not. The need for trained technicians is critical, and industry indicates that at least one trained technician is needed for every engineer. This need has been recognized by the development of the technical institutes programs. The original idea was that these would be two-year terminal certificate programs involving direct training for technician activities. It was understood that these were not pre-engineering programs.

A serious attempt was made to attach high status to these programs so that those trained there would not feel inferior to persons going into engineering education programs. The difficulties started, in the opinion of many experts, when the decision was made in ASEE and ECPD* to have technician programs operate in close association with engineering education programs. The question of status became involved because the technician-oriented group felt they were competing with engineers. The result was first a three-year program and now a four-year program leading to a Bachelor of Engineering Technology. Last month the ECPD Board of Directors authorized its Engineering Technology Committee to evaluate four-year baccalaureate programs in engineering technology for accreditation and thus gave new food to the arguments on both sides.

"The question before ECPD and engineering educators is not whether or not there should be a four-year technology program," said Harold A. Foecke, dean of engineering at Gonzaga University. "Whether we like or not, they are already here—in over 70 institutions. What is more, at least 50 or more have grown up quite apart from ECPD and ASEE and there probably isn't a thing in the world we can do to banish them from existence even if we wanted to ... So, in my opinion, the question is simply whether or not ECPD shall accredit these courses and how soon. Failure to act at all or downright disapproval of these programs would probably compel them to look elsewhere for a standard of quality. This would partly or completely sever the close working relationship between the engineering profession and its high-level support personnel."

To train the kind of technicians needed for industry in this country, a four-year program is not necessary, counters Max S. Peters, dean of engineering at the University of Colorado. "I have talked to many persons in industry," he said, "and they are in complete agreement.

*American Society of Engineering Education and Engineering Council for Professional Development
that the two-year technician training approach is what industry needs, and the four-year technology program, as separate from engineering education, is not necessary. If we are going to have a four-year program, it should be one that leads to the Bachelor of Engineering or, if it is a bachelor of technology, either the word 'engineering' should not be involved or it should be clearly and completely separated from our normal engineering education activities to emphasize that it is a training program and not an education program."

Both parties agree that rapid emergence of ECPD accredited four-year engineering technology programs could certainly have an impact on the total scientific, engineering, and technological manpower picture. At least a temporary decline in bachelor degrees in engineering would have to be expected. But, says Dr. Foecke, the net output of all categories combined would climb. "Until the emergence of the four-year technology programs, many high school graduates, who were undeniably capable of college-level study to a four-year level had no optimum way of pursuing their interests if these happened to be in technology. Technology programs led only to the associate degree and there was all sorts of parental, peer group, and general society pressure to seek some bachelor's degree. The most logical choice would have been engineering, but the reputation of engineering programs was forbidding and the student feared becoming an attrition statistic in a race for which he never had any enthusiasm in the first place. So, some immediately went to programs of secondary interest for their college degree. Others tried engineering and then switched, but always to technology. I believe that the four-year engineering technology program would result in a larger total output of technicians, engineers, and scientists."

What effect would the four-year technology program have on the certification of engineering technicians? "None," says Bernard Rigge, executive secretary of the Institute for the Certification of Engineering Technicians. "What counts toward certification is the termination of an educational program, be it of two-year, three-year, or four-year duration. The Bachelor of Engineering Technology is still somewhat new and industry doesn't quite know what to do with it yet. It would be my guess that the four-year men could more readily go into supervision or management than could their counterparts with two-year educational programs."
MORE ON LICENSING METROLOGISTS

Dear Sir:

A copy of the National Conference of Standards Laboratories December Newsletter arrived at my desk yesterday. Your comments on page 9 concerning the subject of licensing Metrologists were somewhat surprising. Could you have remained after formal adjournment of the session you would have noted that more than 25 people took time out of a busy schedule to discuss the matter of legal qualification of the Metrologist with various members of the Professional Metrology Committee.

The Professional Metrology Committee also found that "licensing" as it is known and practiced is unsatisfactory, not because it raised the hackles on the necks of a few engineers, but because it is totally inadequate for proper qualification of those concerned with the broad scope of metrology. After a prolonged intensive study by members of the committee, and on advice by legal counsel, the official position of the committee is that: "The legal qualification of Metrologists does not appropriately belong with the State Board of Registrations for Civil and Professional Engineers."

Many consider that the total scope of metrology encompasses only that measurement research, design, and practice related to the production and delivery of qualified products to government military and space agencies. The committee has found a greater portion of metrology research, design, and practice exists in everyday, ordinary commercial activity. In the State of California the value of commercial activity directly involving metrology exceeds that generated by government contracts.

Perhaps a short review of the objectives and activities of the Professional Metrology Committee is in order here. The committee is comprised of representatives from Aerospace, Agriculture, Computer Industry, Food Processing Industry, Instrument Manufacturers, a State Agency, and one representative from a federal government agency.

It became evident to members of the committee several years ago that Metrology, the science of measurement, is very significantly involved in almost every aspect of our daily lives, affecting the housewife, the nation's largest corporation, the commercial activity, the industrialist, as well as the government agency. Until that time very few, apparently, realized the extent to which metrology affects us as individuals.

In the State of California alone, many billions of dollars, the committee has ascertained, are spent as the direct result of applied measurements. A few of the more common transactions are: purchasing gasoline at your favorite service station; buying canned and packaged goods at the supermarket; the use of utilities providing your home with light, heat, and water; payment of taxi fares; and your wife's purchase of cosmetics.

In commerce, particularly, the Metrologist and the Metrology Technologist are in unique positions both to determine and to regulate directly the measurements which control the commerce of a state, county, or city. Many instances have been discovered where laws regulating commerce have been enacted which were either unenforceable, or if enforced would force the producer out of business because of limitations which are unmeasurable. In addition cases have been found where the technologist qualifying or certifying public dispensing or measuring equipment such as gasoline pumps, public scales, yardage measuring equipment, etc., had little or no knowledge of the basic conditions necessary for proper calibration or operation of the equipment he was certifying.
The Professional Metrology Committee is carefully studying and evaluating such matters as levels of qualification both professional and technological; education and experience requirements necessary for the various levels of qualification; legal ramifications of licensing, registering, and other methods of qualification; which of the functions of metrology should require qualification; what laws are in existence, if any, authorizing any particular method of qualification; the types of examinations which may be required for the different levels of qualification; and the type of agency which should regulate the qualification of Metrologists and Metrology Technologists. Much still needs to be done before a final decision can be reached, however.

The final objective of the Professional Metrology Committee is to obtain meaningful qualification of Metrologists and Metrology Technologists which will assure adequate measurements in commercial activities without undue or unnecessary restrictions on the professionals and technologists involved. Since government metrology requirements are well documented this effort is not primarily concerned with that area of specialization.

Please feel free to publish this letter in your next newsletter to provide your readers with a more complete knowledge of the real objectives of the Professional Metrology Committee.

Yours very truly,

Thurlow M. Morrow, Chairman
Professional Metrology Committee

The Newsletter Editor is indebted to Mr. Morrow for taking time to discuss the subject of licensing Metrologists. Readers are invited to send in their own comments on the subject.

From Little Acorns

Many a thief has lost his freedom as the result of a misplaced fingerprint. Many an otherwise good vacuum system has lost its performance as the result of a misplaced fingerprint.

An ordinary fingerprint has an outgassing rate of about \(1 \times 10^{-5}\) torr liters per second. At \(1 \times 10^{-10}\) torr, a pumping speed of about 10,000 liters per second would be required just to pump the gas coming from this single fingerprint. A 41-in. diameter orifice leading to the pump would be required in order not to conductance limit the pump.

High temperature bakeout will, of course, partially remove the fingerprint. But, might it not be better to avoid the fingerprint in the first place?

(Quoted by Research/Development from Granville-Phillips Quarterly Rev.)


7. "Dual Ladder: Theory or Practice?", Staff, American Engineer, August 1966. Another viewpoint on the paths of progress for an engineer--technical or managerial path to success?


9. "The Name Is Not The Thing", M. C. Pease, The Microwave Journal, November 1966. He feels the change to Hertz was of no benefit to the engineering profession.


TECHNICAL REFERENCES FOR THE LABORATORY


From the American Engineer, March 1967 several items of interest were noted as we went to press, 1) Pennsylvania State University is again planning an Academic Year Institute from Sep 1967 to Sep 1968, to prepare instructors for a career in teaching engineering technology. Applicants should have "a desire to teach and an interest in physical devices". Information available from O. E. Lancaster, College of Engineering, Pennsylvania State University, 101 Hammond Bldg., University Park, Pa. 16802, 2) In an article entitled "Will Your Pension Plan Move With You" by S. Marczoch, the vital concern of engineers with vested interest in pension or retirement plans who are considering changes in employers, was discussed. A proposal in Congress, introduced by Rep. J. D. Dingell (D. Mich) suggests a special fund within the Dept. of Health, Education, and Welfare which would receive accumulated assets of a transferring employee, and pay him at retirement age or transfer the accumulated assets into a qualified pension fund of the new employer. There also is a movement in the National Society of Professional Engineers to establish a portable pension fund within the Society.

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"The means, methods, precision and sensitivity of measurements always constitute an important factor in the development of science and technology. At present it can be asserted without exaggeration that successes in the field of measurements either predetermine, or at least assist considerably the development of all branches of production, science, and technology."

"The high level of measurement techniques and metrology is a precondition for effective scientific research, and it ensures production control at all stages, thus providing the basis for wide cooperation and specialization in production, and ensuring uniform, authentic measurements - the indispensable condition for the normal functioning and development of our national economy." The preceding quotes are from an article by I. I. Novikov in Izmeritel'naya Tekhnika (Measurements Techniques), January 1966 who was treating the "Basic Trends in the Development of Metrology for the Next Five Years."

The continuing growth of Russian support for measurements engineering, and the extensive technical publicity given to the field of measurements standards in Russian journals, continues to be a source of bewilderment to American measurements engineers. They cannot understand the apparent ignorance in our country, still displayed at all management levels, concerning the dependence of quality and reliability upon accurate measurements. More appalling is the environment prevalent in industry which encourages research, design, reliability, quality assurance, and production engineers to maintain an ignorant complacency toward their ability to specify measurements and tolerances, to perform measurements, and to evaluate precision measurement data obtained under questionable environmental conditions.

Perhaps our complacent engineers can be forgiven in part, on the basis that they have a blind faith in the conduct of the measurement accuracy programs, which may (or may not!) be effective in their plants. But of equal importance are the factors of measurement making and measurement specifying. In the field of measurement specifying lies a most viscous trap--accuracy in measurements does have limitations, and knowledge of limitations must be imparted from the measurements engineer in the calibration activity to the specification engineer in the design activity.

The limitation of knowledge is precisely the point upon which Mr. Novikov was basing his article. He speaks of such Russian standards as mass, temperature, inductance, capacity, and density as meeting, to certain extent, the requirements of modern-day science and technology. But he warns of the inadequacies of the remaining standards citing for instance, the pressure within precision-tool manufacturing to reduce the error in reproducing the meter by at least 50%. He points up the needs of navigation as requiring improvement of time and frequency standards by a factor of 50. A reduction of error by more than 50% is required in reproducing the ampere, volt, ohm, candele, viscosity unit, temperature, force, pressure, and density. Large range extensions are required in temperature, pressure and vacuum.

The balance of the article is devoted to suggestions for relating many standards to molecular, atomic, or nuclear processes, on the premise that progress in establishing standards using the old established techniques, has about reached
the limits in each field. Mr. Novikov points out that the number of Russian metrological institutes* has increased from six to nine, and the technical man-power has been expanded threefold. Work has been expanded in three directions, 1) toward development of new atomic reference standards, 2) precise determination of properties, 3) detection and measuring of signals in presence of large noise backgrounds.

The foregoing information has been presented for two reasons, 1) to indicate that constructive action is underway in countries other than the U.S. directed toward alleviating the needs for national measurements standards, 2) to draw the attention of non-metrology readers to the need for awareness of state-of-the-art standards. Presently, there is a determined effort underway to highlight the wastes, costs, inefficiencies, and impracticalities of many tolerancing practices. These practices relate to allowances for error of so small a dimension as to be incapable of being attained in a plant environment, or more important, of being incapable of being maintained under field-use conditions if attained in the plant. They relate to the inability to physically establish a tolerance because of the inadequacies of present-day testing equipment--these inadequacies being divulged by measurements made by reputable standards laboratories, as contrasted with the advertised claims of the vendor. These practices relate to the tight-tolerancing of all components of a system with no consideration given to the probability of errors adding up to the same polarity or degree. Enough thought has not been given to the ability of components to be degraded in performance and in no way to affect the ultimate specification.

The Aerospace Industries Association of America, working through its Quality Assurance Committee, has established a Task Force Project Team on too-tight tolerancing practices. Frank McGinnis of Sperry Gyroscope Co. Product Assurance Manager, Sperry Gyroscope Co., Great Neck, N.Y. 11020 is chairman of the team, and is anxious to receive from any readers, details of their experiences in this field. Write to him if you have feelings on the subject.

The Team is in the process of completing studies, conducted over the past five years, on the impact of recently-issued government military and space agency specifications related to quality, and in particular to calibration of test instrumentation. In addition, much time was devoted to analyzing the desirability and practicality of the interpretative material contained in the evaluation handbooks, issued to government surveillance activities responsible for monitoring contractors and their calibration activities.


FRINGE BENEFITS?

From Business Week, Jan 28, 1967 comes a report of employer concern with the apathy of employees toward "fringe benefits". Even though the estimate of costs of benefits is one-fourth of the total payrolls, employees don't consider them as benefits, and their cost certainly excluded them from the "fringe" description. A number of examples are given concerning company attempts to publicize in a more favorable fashion that which is now taken for granted. Worth noting by Personnel Departments.
WANTED: MEASUREMENTS ENGINEERS

Those of us who have been looking for skilled help during the past couple of years, can look upon the Help Wanted outlook with a good deal of consternation, judging from some forecasts appearing in a recent issue of the Electronic news. True, the figures are presented for engineers in general, but with the lack of formal training in measurements engineering currently, the chart presented below is the optimistic picture of scarcity, not the pessimistic. Truly, things are not getting better.

Since technical manpower is a chronic shortage, and many graduates continue on into graduate study (not always for professional reasons!), a good deal of talent search has been abroad. Speaking from personal experience however, I can safely declare that the needs in metrology will not be met there. The universities abroad presently are doing no better job in fulfilling requirements for measurements engineers than are those in the U.S. To try to lure qualified experienced workers from established laboratories becomes a frustrating task. Most have national or ethnic ties which they are loath to break, particularly on a permanent basis.

For many of us in this measurements business, it still appears that the best bet for the future is encouragement of technicians to return to school for study at night towards a full degree.
SHOCK AND VIBRATION OF STANDARD CELLS

How stable and reliable is that standard cell when subjected to what is normally considered adverse handling and environmental conditions? The need to know the performance characteristics of voltage references when operated outside of laboratory conditions has made this an important question to metrology engineers and instrument manufacturers alike. In the past half dozen years, much progress has been made in advancing the "state of the art" of parallel devices such as the Zener diode and, indeed, future developments in this direction may provide the ideal answer to the problem. Meanwhile, the standard cell continues to give a good account of itself and there is increasing evidence it is not the delicate item everyone once thought it was. Recently, NBS, manufacturers of standard cells and users have come forth with some interesting statistics along this line.

A good deal of work has been done with the unsaturated cell. BRADD and EICHE, NBS, Washington, D. C., published a paper in 1962 detailing their findings after such cells were subjected to a series of shock and vibration tests. Briefly described, the effect of mechanical vibration and shock on a group of four 500-ohm unsaturated standard cells was investigated (2 each from separate manufacturers). Vibration studies were conducted at frequencies of 10, 20, 30, 50, 70, 100, 200, 500 and 1000 Hz with accelerations of 1, 2, 5, 7 and 10g. The shock studies were conducted with shock durations of 6.2, 11 and 18 milliseconds and shock accelerations of 10, 20, 30 and 40g. Transient AC and DC cell outputs were observed related to the magnitude of the acceleration and the frequency of the vibration. The observed shift in DC emf in the cells was within the 0.01 percent limit of precision usually assigned to cells of this type, for all frequencies at 1g acceleration. For the more severe conditions at 10g acceleration, the AC and DC transient effects exceeded the 0.01 percent level. The AC output of the cell was large and exceeded 0.1 mv on many occasions. The shocks were almost without effect on the DC emf. The cells were within the 0.01 percent level of precision during the shock studies; indeed, the shift in DC emf was less than 2 µv. However, test cell output transients during the shock study often times exceeded 1 mv. After the cells were subjected to shock or vibration, the cells recovered within the 0.01 percent level of precision almost instantaneously, and the cells returned to the preshock or vibration condition in less than 3 min. The authors were continually amazed by the ruggedness and dependability of the cells used in this study. The unsaturated standard cell did not behave as a "delicate" standard. The authors felt the results of their investigation would probably apply qualitatively to unsaturated cells of other sizes, shapes and constructions.

The fully saturated standard cell has traditionally been the most stable voltage reference available when maintained in a closely controlled environment and carefully handled to prevent inversion or shock and vibration of any magnitude. However, a special version of this type cell, the so-called

"portable saturated cell with septum" appears to have overcome some of these latter difficulties as regards general handling, and while it is too early to state what their truly long-term stability might be, for the brief period during which histories have been recorded, their performance looks most encouraging. When this type of saturated cell was originally developed, problems of stability were encountered because of electro-chemical interaction between the cell materials and the material used to form the septum. This appears now to have been overcome, at least when discussing a minimum stability time of five years.

It is interesting to note the similarity of construction between the traditional unsaturated cell and the new saturated cell with septum. Based on this, there would be reason to believe that these cells might have the same general performance characteristics when subjected to shock and vibration. One manufacturer of standard cell enclosures recently ran a series of shock tests on saturated cells with septum (coincidentally enough without knowledge of the paper by Brodd and Eiche).

The results obtained were quite similar excepting performances was improved in ratio to what might be expected from each type under normal conditions. Briefly described, two cells at a time in different 4-cell enclosures were connected back-to-back. One enclosure was then dropped 4 inches on each of its edges in turn and the changes in cell voltage, as referenced to the cell in the other enclosure, were plotted on a chart recorder. All cells recovered to within 10 ppm in 1 min. or less and to within 1.0 ppm in less than 10 minutes. Interestingly enough, as the enclosure was dropped, the excursions of cells 1 through 4 got progressively less, going from a maximum of 16 microvolts to 7 microvolts. The investigator hypothesized that the voltage shift was due to movement of the crystals of cadmium sulphate and after the first few shocks any loose crystals had stabilized and the voltage shift was consequently smaller. (He quickly points out, however, that he is not suggesting that the user continually drop his first line cells to improve their quality!)

Practical application of this ruggedness in saturated standard cells has been made by IBM, San Jose, California, as reported by DeWAYNE SHARPE, Head, Corporate Measurement Standards Task Group. This company maintains a group of 18 reference cells of the conventional saturated type as their plant standard but employs 3 groups of 3 each portable saturated cells which are alternately rotated to NBS and NRC and serve as transfer standards to check against their permanent reference. The cells are mounted in a special container and shipped by air in a heated cabin without further precaution. The figures recorded so far show a deviation of a few tenths of a ppm, excepting in two instances where a downward shift of 1.2 and 1.7 microvolts was observed (but there was a suspicion that extremely bad handling was involved here).²

Subsequent discussions with DeWayne Sharpe have revealed that their interest so far has only been in relatively short-term stability but he hoped to initiate a program which would provide figures over longer time intervals.

²"The Establishment and Determination of the Volt at San Jose." Prepared by A. E. Warwick.
He noted that they use saturated standard cells with septum from the two major suppliers of this item and, in addition, had purchased some cells of the same type from the PTB in Germany.

The United States Air Force Calibration Program has been using saturated cells with septas as transfer standards for 5 years. As yet, results have not been reported officially or statistically in a paper, but based on conversations with LLOYD ROOT at Heath AFB, the program has been satisfactory and encouraging.

The contributors to this article would appreciate receiving further information on the usage of standard cells that might be of interest to NCSL members. Particularly, data pertaining to in-house programs involving long-term statistics would be most welcome. This discussion has been brief by necessity but could be expanded to include new information in future issues.

(Contributed by M. STEINBERG, B. LAVALLEE, F. SCIACCHITANO)

QUOTEABLE QUOTES

"We should expect standards to change - some will change slowly perhaps, but a great many will change rapidly... What must be avoided, if technology and the industrial processes are not to be circumscribed, is the creation of standards for standard's sake."

(C. H. Linder, Past President-IEEE, from Magazine of Standards)

"The mess-in-measurements problem comes to full bloom in the current controversy about measurement systems. Because of general ignorance in measurements, the issue has brought forth some of the most egregious assaults upon reason in recent years. The most successful argument is, strangely enough, the most assailable. We should go "metric" because 90 percent of the nations are legally on that system. This implies that legal adoption of a system is tantamount to popular use. No nation, anywhere, completely uses the metric system, legality notwithstanding. It implies that the U.S. is officially opposed to the metric system. Actually, it has been the legal basis for our measurements since 1893. Even if the premises were correct, they would be irrelevant. The production of one single automatic washer requires more measurements than are performed in one week by some of the newly emerging African nations, all of whom are legally metric. The most successful argument of the other side is: The U.S. should fight metric encroachments because to "go metric" would cost you-name-it billions of dollars and probably bankrupt us. This is an odd argument from a nation that thrives on obsolescence. The most ingenious argument goes as follows: We should "go metric" and get rid of those awful fractions. Who ever heard an Italian order 500cc of wine? He orders half a liter. The most widely used decimal system in the world is U.S. currency, yet nothing has replaced the "half" and the "quarter". Conversely we divide the gallon into quarts, pints, and gills, but we buy gasoline in tenths of gallons. Regardless of systems, fractions are used for the vernacular, decimals for computation."

(T. Busch, Industrial Quality Control)
Corporations should adopt the "ombudsman" (from Sweden) concept, to supply a sympathetic ear for engineers who, for one reason or another, are unhappy in their present assignment. The assumption is that they still want to remain with the organization but not in the same slot. The ombudsman would be familiar with the many activities within the organization, and would know whether other positions were open or likely to become available soon. Advantages quoted by S. J. CARRIS of Electronics Personnel are 1) a valuable employee is retained, 2) the company saves a recruiting fee, 3) employee stays with company he likes and retains fringe benefits, 4) company determines more quickly poor or inadequate leadership qualities in middle management.

(M. Mandell, Electronic Products)

NEWS FROM THE OUTLAND

As a result of our December request to update the Newsletter mailing list, a number of personal notes came in from readers. We can't acknowledge all, but we felt obliged to mention the special letter received from F. S. SWARTZ. He related his experiences in entertaining fashion from the time of his retirement last October, from his Air Force affiliation in Gulfport, Miss., to his arrival at the new home - 1510 E. Atchinson Street, Pasadena, Calif. 91104. He appears to have resettled comfortably and together with his wife, who has improved somewhat in health, is exploring Southern California while setting up a little calibration laboratory of his own. By the way, he won't turn down business from nearby industrial plants.

We note, somewhat belatedly, that DEWAYNE SHARP of NCSL is also Director of Measurement Standards Instrumentation Division (MESTIND) of ISA and that DICK CERNI is Director of the Data Handling and Computation Division (DAHCOD) of ISA. Good luck to both.

"OOPS—WRONG SCALE!"
The December 1966 issue of the IEEE Transactions on Instrumentation and Measurements has just been received. It contains a wealth of good papers which should be available to all measurements people. The index includes:

The Work of the Bureau International des Poids et Mesures Concerning Electromagnetic Units and Measurements
J. Terrien

Some Aspects of Fringe Counting in Laser Interferometers Interferometric Measurements on Diffuse Surfaces by
Holographic Techniques
W.R.C. Rowley
K.A. Haines et al

Calorimetric Measurement of Pulsed Laser Output Energy
D.A. Jennings

An Intercomparison of Hydrogen and Cesium Frequency Standards
R. Vessot et al

Clock Synchronization via Relay II Satellite
W. Markowitz et al

A Meteor Burst Clock Synchronization Experiment
W.R. Sanders et al

A Dual Frequency VLF Timing System
L. Fey et al

An Improved 5 MHz Reference Oscillator for Time and Frequency Standard Applications
H.S. Pustarfi

Measurement of FM Noise Spectra of Low-Noise VHF Crystal Controlled Oscillators
R.E. Paradysz et al

A Direct-Current-Comparator Ratio Bridge for Four-Terminal Resistance Measurements
M.P. MacMartin et al

Increased Accuracy for Resistance Measurements
A.F. Dunn

Precision Measuring Equipment for Electrical Power in the Range of Audio Frequencies
R. Friedl et al

Stress Sensitivity of Manganin Resistor in High-Current Precision Coaxial Shunt
W.F. Praeg

Magnetic Potentiometer of High Precision
K. Heumann

Precise Current Regulation with a Transducor
George O. Hendry

A Direct-Reading Current-Comparator Bridge for Scaling Four-Terminal Impedances at Audio Frequencies
W.J.M. Moore et al

Thermal Converters for Audio-Frequency Voltage Measurements of High Accuracy
F.L. Hermach et al

Recent Advances in High-Frequency Performance of Feedback Amplifier-Transformer Combinations
Peter Richman

A New and Unique Analog-to-Digital Conversion Technique
William R. McCullough

Refinements in Precision Kilovolt Pulse Measurements
W.R. Fowkes et al

A 0.1 to 10 MHz Dielectric Specimen Bridge with Dissipation Factor Accuracy of ± 10⁻⁶
L. D. White et al

An Impulse Spectral Intensity Measurement System
Robert B. Andrews, Jr.

A 5 to 50 MHz Direct-Reading Phase Meter with Hundreth-Degree Precision
Donald E. Maxwell

Noise Comparators and Standards for S and X Bands
G. J. Halford

Precision Power Measurements of Spacecraft CW Signal Level with Microwave Noise Standards
C.T. Stelzried et al

A New Technique for Accurate RF Attenuation Measurements
H.L. Kaylie

Some New High-Frequency Wattmeters Operated by Forces Arising from a Rate of Change of Electromagnetic Momentum
H.M. Barlow

A Coaxial Radio-Frequency Power Standard
A. Jurkus

System for Transfer of Calibration Factor for Coaxial Colometer Mounts with One Percent Transfer Inaccuracy
G.U. Sorger et al

Skin-Effect Corrections in Impittance and Scattering Coefficient Standards Employing Precision Air-Dielectric Coaxial Lines
John Zorzy
Some Techniques and Their Limitations as Related to the Measurement of Small Reflections in Precision Coaxial Transmission Lines

Precision Coaxial Connectors in Lumped Parameter Impedance Measurement

Evaluation of a Stark Voltmeter

Calibration and Stability of a Millimeter Confocal Wavemeter

Interpretation of Ferromagnetic Resonance Measurement Made in a Nonresonant System

The National Measurement Systems of Various Countries

Thomas E. MacKenzie

R.N. Jones et al

Y. Beers et al

C. J. Zamites, Jr.

A.S. Risley

Harvey W. Lance

NBS SERVICES

Since the last announcement of calibration services in June 1966, a number of new calibration services have been offered. Some undoubtedly are known to you, but it is felt advisable to list all information available.

Measurement of Mismatch in WR112 and WR187 wave guides at any frequency suitable to size guide submitted. Suggested frequencies are 7.75, 8.50, 9.00 GHz (112) and 4.35, 4.90, 5.25 GHz (187). Range extends from 0.24 to 0.2. Radio Standards Laboratory at Boulder.

Microwave Power in WR187 wave guide, preferably at frequencies of 4.35, 4.90, and 5.25 GHz. Quantities measured are 1) Effective Efficiency for bolometer units (ratio of substituted dc power in bolometer unit to microwave power dissipated within bolometer unit), 2) Calibration Factor for bolometer units (ratio of substituted dc power in the bolometer unit to the microwave power incident upon bolometer unit), 3) Calibration Factor for bolometer-coupler units (ratio of substituted dc power in the bolometer unit on the side arm of the directional coupler to the microwave power incident upon a nonreflecting load attached at the output port of the main arm). Radio Standards Laboratory at Boulder.

Pulse generators and peak-reading pulse voltmeters in the range 5 to 1000 volts peak are now being calibrated at the Radio Standards Laboratory at Boulder. The following measurement limits are established 1) Range 5 to 100 volts, minimum rise time 10 nanoseconds, duration 10 nanoseconds; maximum pulse duration 100 microseconds, 2) 100 to 1000 volts—minimum rise time 30 nanoseconds, duration 30 nanoseconds; maximum pulse duration 5 microseconds with duty factor of 0.01 or less. Uncertainty of measurements over range 5 to 1000 volts is 1%.
Effective Efficiency of coaxial bolometer mounts over the range 4 to 10 GHz now is a measurement service of the Radio Standards Laboratory at Boulder. Previous service was only offered at 9 GHz.

NBS DEVICES

From results of a study sponsored by NASA, the Institute for Basic Standards has adopted new standards of total irradiance. It was shown by Stair, Schneider, and Fussell of IBS that tungsten-filament lamps are more accurate, available in wider range of output, and operable at higher temperatures than the previous carbon-filament lamp standards. The new standards are of three sizes—100, 500, and 1000 watts and operate at color temperatures of 2700 to 2950°K.

The Gaithersburg laboratories have made a new absolute determination of acceleration due to gravity under direction of D. R. Tate of NBS/IBS. The result is indicated as 9.801018 m/s², with a standard deviation of 0.3x10⁻⁵ m/s². A detailed report is presently in preparation.

Supporting large Dewar flasks safely and conveniently has been a problem in many laboratories. W. J. McKeen of NBS/IMS has made a new type clamp consisting of a cylindrical sleeve which has been slotted to provide a number of fingers around the cylinder wall. Strips of cork are cemented on the inside surface of these fingers to grip the Dewar neck uniformly by adjusting aircraft-type hose clamps. A flange around the bottom of the cylindrical clamp holds the entire assembly on a support table. More particulars will appear in the Technical News Bulletin shortly.

1967 NCSL DIRECTORY

There have been some unavoidable delays in getting going on the new Directory, but by the time this newsletter is published, questionnaires will have been mailed to NCSL members, non-members listed in the 1965 edition, and other non-members who have told the Committee they want to be listed. Any non-members on the newsletter mailing list not in one of the above three categories will also receive questionnaires in case they, too, desire to be listed.

Please note that although the cut-off date for listing is May 1, prompt replies are requested. In other words, please fill out and return the form as soon as possible after you get it. The May 1 date was set to allow for failure to receive questionnaires, sickness and the like. If anyone in the above categories has not received a questionnaire by April 1, please notify:

Chairman, 1967 Directory Committee
NCSL Secretariat
c/o National Bureau of Standards
Washington, DC 20234
Here is a practical tip extracted from the Metrology Bulletin (BuNavWeps) of June 1962 which should be drawn to the attention of your plant's electricians working on new replacement raceways.

Small steel outlet-equipped electrical raceways are used in many laboratories to distribute line power on workbenches. These have been found to be the source of measurement system malfunction in the laboratory of the Metrology Department at Pomona. The difficulties encountered were caused in part by the fact that some of these assemblies rely upon a friction contact to connect the ground to the steel raceway at the back of each ASA grounding outlet. This insecure electrical contact is further complicated by the presence of a rather excellent paint coat on the inside of the raceway. The friction grounding fingers must penetrate this coating in order to effect a ground.

Tests were performed on these contacts between the receptacle ground and the raceway. The entire assembly was new. The resistance when measured with a bridge was only a few milliohms and was stable. Experience with units which have been in service two years or more has shown that the failure current was low and that some of the grounds in the receptable had become ineffective. During tests erratic operation of the systems has been traced to intermittent grounds inside these raceways.

Further, the two wires used to feed the AC line contacts in the receptacles are of a friction type. As with the grounds, these contacts exhibit suitably low resistance when new. The contacts do not, however, have any wiping action to assist in the retention of a satisfactory electrical surface, and one is bare copper wire with no protective plating.

To avoid problems which may arise from these foregoing items, it is suggested that the paint be removed from the contact areas of suspected raceways equipped with friction grounds, or the assemblies replaced. New installations would offer superior electrical integrity if the larger "3000 series" of raceway is utilized. Such moldings are designed to accept conventional outlet receptacles and have sufficient room to wire in the usual fashion. Thus, grounds and line wires may be secured under screws or even soldered. In this way troublesome defective ground and series noise sources may be minimized. An added advantage in using larger raceways is that inside space is available for terminal strips. This makes it possible to wire individual outlets as separate branch circuits instead of connecting outlets along a line where each new equipment current modulates the line of all earlier connected equipments.

The head of civil engineering at M.I.T., C. L. Miller has made some interesting predictions, as reported in American Engineer, March 1967, concerning the practice of engineering ten years from now. He visualizes an elite corps of "master designers" composed of gifted, brilliant, highly creative and skilled engineers concerned with the generation of new design concepts and decisions on alternatives. Work will be conducted as part of a system, incorporating computers and information files. Engineering design will be programmed wherever possible; design will be removed from the drawing board (static) to a more dynamic form of communication--to be evolved in the engineering schools. Engineering design education during the next five years should be highly research-oriented; formal education should require study through PhD level, plus post-doctoral study. (Ed. Note) The future of measurements looks assured since the basis for all this advance is information, and information is a measure since Webster defines it as "knowledge derived from observation".

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During meetings of the XXIII Congress of the Communist Party of the Soviet Union held last year, formulation of the overall five year plan ending in 1970 expects a rise in national income of 38-41%, an annual rise in total production of all branches of Russian industry of more than 7%. In an atmosphere of "Leninist revolutionary spirit and a swing, in a businesslike manner and a thoughtful realistic approach to the solution of important and complex economic and political problems, the Party hides nothing from the people" - L. S. Brezhnev's report and contributions of the delegates dealt not only with our successes, but also with existing deficiencies.

It is of interest to note some of the deficiencies. Although "scientific and technical progress are undisissolubly linked with the raising of quality of production", many (instrument) plants continue to produce articles whose technical level falls short of modern requirements. This applies fully to the production of measuring equipment. Far from all the equipment supplied to metrologists meets the new requirements. The Conference decision should put an end to this state of affairs. The part played by design offices will be greatly raised. Their personnel will be more closely linked with enterprises and provided with all the necessary conditions for creative work, and for displaying their individual capacities. These and other measures will raise the responsibility of designers for attaining a high technical level in their design and development work.

A. S. Kosygin reported on the necessity to re-equip the entire instrument-making industry, increase the production of precision measuring equipment, and raise the degree of accuracy. He was quite definite concerning the expanding and important role to be played by electronic computers in research, design, and production.

B. M. Stepanov reported that "the exchange of technical information has not as yet been adequately organized in our country." To correct the inadequacies Stepanov proposed, and an official assignment was made by the Congress, for establishment of an All-Union system of scientific information, in order to speed up the applications of the scientific/technical achievements, thereby reducing duplication of research and design work. He felt this would be of extreme importance to instrument making and to metrology.

*As reported in Ismeritel'naya Tekhnica, May 1966--"Towards New Achievements"
APPLICATION FOR MEMBERSHIP
NATIONAL CONFERENCE OF STANDARDS LABORATORIES

Name of Laboratory or Organization

Address

applies for membership in the National Conference of Standards Laboratories and appoints as its Delegate

Name and Title

who will serve until June 30, 1967

Signed: __________________________

Title: __________________________

Date: __________________________

The NCSL is a continuing non-profit association whose members are either measurement standards and calibration laboratories, organizations maintaining such activities or other organizations having related interests whether operated under academic, scientific, industrial, commercial or government auspice.

Application for membership is made by completing the above form and submitting it together with the annual dues of fifty dollars ($50.00). Checks should be made payable to the National Conference of Standards Laboratories.

Applications may be mailed to:

Mr. Donald DeLauer, Chief
Det. #2 2802d IG&C Qp
P. O. Box 1525
Vandenberg AFB, California 93437

If an otherwise qualified organization finds it impossible to become a member organization by payment of dues as such, it may be granted member privileges by payment of an equivalent registration fee in advance of the Delegate's Assembly.