Reports of Meetings on Instrumentation

The Fourth Annual Conference and Exhibit of the Instrument Society of America

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Sixty-five technical papers presented at 23 sessions, five cooperating societies; 8,000 in attendance, 150 exhibitors showing $6,000,000 worth of new or improved instruments, components or accessories, spread over 20,000 square feet of the huge Municipal Auditorium in St. Louis—these are the bare statistics of the week-long conference and exhibit of the Instrument Society of America, held September 12–16.

One of the youngest and fastest growing of the technical societies, the ISA brought together at St. Louis, in this field of common interest, several other scientific and engineering societies. The Industrial Instruments and Regulators Division of the American Society of Mechanical Engineers had two sessions; the American Institute of Electrical Engineers two; the American Institute of Physics two; and the National Telemetering Forum two. Members of any of these cooperating groups (or the Institute of Radio Engineers) were admitted without charge to all sessions, as well as to the exhibits.

In general, the problems of measurement and control in any branch of experimental science or industry require for their solution the design, development, selection, adaptation, procurement, understanding, and use of measuring devices and techniques. This, broadly, is the field of instrumentation, the art and the science of measurement and control. The promise of this newly recognized branch of applied science lies in the universality of its contributions—it is an indispensable and integral part of all of the specialized sciences, and any discovery or improvement of devices and techniques for measurement and control of any physical quantity can find immediate application in many unrelated specialties of science or engineering. Its strength lies in the universality of its sources of progress—the operating principles of measuring devices are drawn from all the basic fields of science, and any discovery or advance in any field is likely to find eventual or immediate application in a new or improved device for use in still other fields.

Within the last decade or two, the growing complexity of science and technology has made it impossible for the engineer or scientist to keep abreast of instrument developments and measuring techniques in other fields. Hence, the emergence of the new science of instrumentation and its practitioners, specializing in cutting across specialties and cross-fertilizing all the sciences.

The Society. The ISA was formed in 1945 as a combination of a number of local instrument societies in various centers of industrial or scientific activity, and now has 34 sections in the United States, two in Canada, and one in Netherlands West Indies, with a membership of over 3,000.

The objective of the society is "to advance the arts and sciences connected with the theory, design, manufacture and use of instruments in the various sciences and technologies." The various sections hold regular meetings and national meetings are held twice yearly: the spring meeting for a one- or two-day period, and the annual conference and exhibit for five days, during the first half of September. The location changes each year. The society publishes the *Proceedings,* containing papers presented at ISA sessions during the annual conference, and also edits a special "Journal" section of the monthly magazine, *Instruments,* which each member receives. Special publications are proposed by the working committees of the society, of which there are more than a score. ISA officers for 1950 are: R. Piggott, president; A. O. Beckman, J. B. McMahon, Nelson Gildersleeve, and Porter Hart, vice presidents; Hugh Ferguson, treasurer; and Richard Rimbach, executive secretary.

The Conference. Conferences are much alike, whether the papers relate to star spectra, enzymes, or automatic control. People drift in and out, talk to colleagues in the halls, ask a few questions on the floor, and grill the speakers later in small groups.

The ISA papers were available in preprint form, which made for better discussion. There were sessions on maintenance and operation, inspection and gaging, instrumentation for production processes, transportation instruments, instrumentation for testing, and analysis instrumentation. A symposium was held on rockets and jets and a number of papers in the session on instrumentation for testing related to the currently "hot" problem of testing rockets and jets. Speakers at all sessions were allowed at least twenty minutes, and in some sessions up to an hour. Attendance ranged from one hundred to four or five hundred. Some of the papers were summarized especially for *Science* by the authors and are presented elsewhere in this issue.

At the annual business meeting a paper was presented on "Instrumentation Flow Plan Symbols," by David E. Hostedler (Foster-Wheeler Corp., New York), as illustrating outstanding work done by a subcommittee of the Recommended Practices Committee.

On the weekend preceding the conference, the ISA, in cooperation with a number of manufacturers, sponsored an "Instrument Maintenance Clinic" for instrument technicians, which proved extremely popular. The conference sessions on instrument maintenance and operation were also well attended. A panel discussion was held on "Instrument Mechanic Training."

The Exhibit. The hundreds of instruments and components displayed or demonstrated at the exhibit received

careful inspection and study from the engineers, scientists, technical men, purchasing agents, and industrialists in attendance.

No catalog of the products displayed could convey the educational value of the exhibit. The variety of exhibits precluded any monotony: miniature ball bearings, large 10-in. control valves, recording spectrophotometers, glass thermometers—any of those might be found in the booth next to electronic vibration devices, or an X-ray diffraction equipment.

The big manufacturers of indicating and recording instruments were all represented by large displays. The large number of control components and instruments reflected the fact that the process industries (chemicals, petroleum, metals, etc.) furnish the largest base for the instrument industry, and for the membership of the ISA.

Significant of the role of advanced instrumentation in industry was the showing of soundly engineered commercial products such as the recording spectrophotometer with nearly 100% automaticity, supersonic generators and materials testing devices, computing mechanisms, X-ray diffraction equipment, etc., which only a few years ago were new in the research laboratory, as rough experimental models.

Instruments for measurement and control of flow, temperature, time, and chemical concentration, were much in evidence. But electronic, radioactive, geophysical, and mechano-electronic devices were also shown in profusion: the mass spectrograph leak detector, vibration pickups, roughness indicators, accelerometers, etc.

Various agencies of the government had been invited to participate in the exhibit. The Department of the Navy was represented by the Bureau of Ordnance, the Naval Ordnance Laboratory, the Naval Ordnance Test Station, and the Bureau of Aeronautics. The National Bureau of Standards also had an exhibit. One of the most striking Navy exhibits was a radio tracking equipment (Raydist), recording in the booth the location of a boat cruising up and down the Mississippi, carrying a transmitter. Another was an X-ray planigraph, in which the object being X-rayed was oscillated in a complicated motion during exposure. The resulting picture showed clearly the details of structure in a certain selected plane within the object.

It is to be hoped that, in the future, participation of such agencies as the Public Health Service, the Atomic Energy Commission, and the Bureau of Reclamation will be obtained, to bring the instrument developments in these fields to the attention of the technical public and give stimulus to joint attacks on special measurement problems.

Participation of manufacturers of biological and medical equipment might be increased by arranging some joint sessions with the American Medical Society, perhaps, or the American Physiological Society. The problems of measurement in the study of the human body and its ills, in physiology, and in biology generally, may be sufficiently specialized, and are certainly sufficiently important, to justify inclusion of these fields in the area of cooperative effort of the ISA.

But the society, and the exhibit, are new: they will develop, and will emphasize, those fields in which the greatest interest is found. Each member of the AAAS who can do so should attend future ISA exhibits and participate in its conferences.

The 1950 conference will be held next September in Buffalo, N. Y.

Fourth Conference on Low Temperature Calorimetry

Daniel R. Stull

Dow Chemical Company, Midland, Michigan

The Fourth Conference on Low Temperature Calorimetry was held in Cambridge, Massachusetts, on September 10, during the meeting of the International Conference on the Physics of Very Low Temperatures. Both conferences met at the Massachusetts Institute of Technology and, because of the similarity of interests, each conference was attended by some members of the other group. The morning and afternoon sessions were attended by representatives of some 25 university, industrial, and government laboratories from Europe and the U. S. In the absence of Hugh M. Huffman, chairman of the previous three sessions of this conference, the meeting was presided over by Daniel R. Stull, of the Dow Chemical Company.

Herman L. Fink, of the U. S. Bureau of Mines, presented a report on thermochemical and calorimetric standards by the Subcommittee of the NRC Committee on Physical Chemistry. The report pointed out that by international agreement the absolute joule has been selected as the standard unit of energy. This unit may be transferred from the national standardizing laboratories to the investigator's laboratory by the use of appropriate electrical standards and in some cases by means of a standard substance which takes part in a chemical reaction. The report continued with recommendations bearing on the physical states and chemical changes involved in calorimetric measurements, and dealt more specifically with the problems associated with combustion calorimetry; specific heat of solids, liquids, and gases; and solution calorimetry, including heats of solution, heats of reaction, and heats of dilution.

In former meetings of this conference, three substances were chosen as standard materials for the comparison of calorimeters. Normal heptane (bp + 98.4° C, mp − 90.55° C) was selected as a liquid for the low temperature range, benzoic acid (mp + 122.36° C) as a solid substance for the same range, and synthetic sapphire for work at high temperatures. These samples have been prepared under the direction of Edward Wichers of the National Bureau of Standards, and the methods and precautions observed in their preparation were described to the conference by George T. Furukawa. They are now ready for issue, and are not regarded as part of the standard sample series of the bureau, but are reserved for the use of the conference and for related special purposes. Since the

initial purpose of these samples is the comparison of the values of specific heat measured in different calorimeters and by different methods, and in view of the elaborate purification and high purity of the samples, it was the recommendation of the conference that the samples not be squandered by use as a calibrating substance, but used for the purpose of comparison. Hence, the above samples will be issued without charge by the National Bureau of Standards to any reputable laboratory agreeing to report the results of their measurements to the bureau. Requests for these samples should be made to F. G. Brickwedde, National Bureau of Standards, Washington 25, D. C. It was suggested that the results of these measurements and their comparison would be of interest to the conference at some future meeting.

A discussion arose over the merits of a fractional melting technique vs. a fractional freeezing technique as a method of purification. It was brought out that when thermal equilibrium exists, these two methods become identical.

John G. Aston described plans for reestablishing the temperature scale of Pennsylvania State College. Since 1933 the temperature scale of this laboratory has been based on copper-constantan thermocouples which are now about worn out. The new scale will be based on eight platinum resistance thermometers, and will be compared with a helium gas thermometer from 10° to 90° K. In close cooperation with the National Bureau of Standards, improved apparatus, particularly manometry, has been constructed, which Dr. Aston feels will decrease the departure of his scale from the true thermodynamic temperature scale to about 0.03°.

H. L. Johnston, of Ohio State University, mentioned some high pressure PVT (pressure-volume-temperature) work in progress in his laboratory which will yield improved virial coefficients of helium, and decrease their uncertainty to perhaps one third. Dr. Brickwedde pointed out that increased certainty in these virial coefficients would depend upon the value of the gas constant R. Drs. Johnston and Brickwedde then developed the facts that the thermodynamic temperature scale (based on a perfect gas) could be defined in two different ways: (1) the difference in temperature between two thermal states (say steam and ice) can be assigned a value; and (2) a value can be assigned to a single thermal state (say the ice point). Thus, either way, the whole scale will be fixed. Dr. Brickwedde remarked that the International Union of Physics at its last meeting had recommended that the temperature of the ice point be selected once and for all time by the International Bureau of Weights and Measures.

Another project of the conference aimed at unification of the temperature scales of the various laboratories engaged in calorimetry was the construction of forty platinum resistance thermometers (platinum thimble type) of one lot of platinum wire by the Leeds & Northrup Company of Philadelphia. These forty thermometers have been purchased by various laboratories, and are being sent to the National Bureau of Standards for calibration. By special arrangement, the bureau will calibrate these thermometers down to 11° K. Harold J. Hoge described the methods used to compare these thermometers with NBS standard platinum resistance thermometers previously calibrated against a helium gas thermometer. Dr. Hoge mentioned that up to the present time, sixteen of these thermometers have been calibrated from 11° K, two are in the process of calibration, and six are awaiting calibration.

F. W. Schwab and E. Wichers (*J. Res. Nat. Bur. Stand.*, 1945, 34, 333) have developed a Pyrex cell containing benzoic acid for use as a secondary fixed point in thermometry. Dr. Hoge reported that to date more than sixty of these had been issued, and are certified $\pm 0.003°$ C by the bureau. Experimental work is now in progress on new cells containing diphenyl oxide, tert-butyl alcohol, and normal heptane.

Dr. Hoge also described a special potentiometer in use by the bureau, and built by the Rubicon Instrument Company, of Philadelphia. This potentiometer will measure up to a total of 31 v with a precision of one part in ten thousand when measuring over one volt.

R. B. Scott described a new Simon type helium liquifier recently built at the National Bureau of Standards. It contains a stainless steel bomb of 1800-ml capacity surrounded by liquid hydrogen and in turn by liquid air.

J. G. Aston described a convenient helium liquifier recently built in his laboratory. The constructional features are such that the apparatus lends itself nicely to a variety of different experiments. At present it is being used to study the adsorption of gases on titanium dioxide. The equipment contains a Woods metal joint which is easily opened and closed vacuum tight.

E. F. Mueller, of the National Bureau of Standards, described two unsuccessful attempts to construct platinum resistance thermometers of 1.25-mil wire. He described two G2 Type Mueller bridges (constructed by Leeds & Northrup Company, of Philadelphia, for the bureau) containing resistors made of the new gold-chromium alloy which is reputed to have properties somewhat improved over manganin. He reported that a third such bridge has been built by the General Electric Company of Schenectady, New York.

New alloys are in prospect which may meet the stringent requirements set down by Mr. Mueller, as follows:

1. The wire shall have a coefficient from 20° to 30° C which does not exceed 1 ppm.
2. As the temperature of the coil goes up above 25° C, the resistance goes down.
3. The coil must be stable over a period of time.

In 1947 Mr. Mueller designed an improved bridge along the lines of the G2 type. Among the new features may be listed:

1. Range up to 400 ohms.
2. Lowest dial has steps of 0.00001 ohm.
3. Milliammeter improved so that by taking the resistance at two values of current one can extrapolate to the resistance at zero current.
4. Commutator also reverses the ratio arms.
5. Larger knobs on the dials.
6. Twelve positions on each dial.

I. Estermann reported on another project carried out by members of the conference. During the war, some of the specialty calorimetric materials were ordered in bulk, and resold to participating laboratories on a nonprofit basis. For example, some twelve or fifteen participants made up an order of some $2500 worth of monel and inconel tubing. If ordered individually, it would have cost at least twice this figure. In some cases, short pieces were shipped by mail from the Carnegie Institute stock, and much time was saved. In about six weeks or so, another order will be gotten together, and anyone interested should write to I. Estermann, Carnegie Institute of Technology, Pittsburgh.

Dr. Estermann emphasized the fact that in several cases errors in third law entropies have come from transitions which occur below the temperatures which can be reached by liquid nitrogen. Hence, extrapolation from liquid nitrogen temperatures to absolute zero involves this uncertainty. Dr. Estermann also proposed a rapid search with a calorimeter of say 1 to 2% accuracy to hunt for such transitions, and to survey a number of compounds to single out those profitable for further study.

Symposia on Conformal Mapping and the Monte Carlo Method[1]

J. H. Curtiss and E. F. Beckenbach

National Bureau of Standards, Washington, D. C.

Symposia on the Construction and Applications of Conformal Maps and on the Monte Carlo Method were held in Los Angeles at the Institute for Numerical Analysis of the National Bureau of Standards at the end of June. Between these two symposia, a two-day condensed course in automatic computation was given under the direction of Harry D. Huskey, head of the Machine Development Unit of the institute. The symposia and the condensed course formed an integrated series of lectures and discussions on topics pertinent to the work of the institute, which lasted for some ten days—from June 22 to July 1 inclusive. The combined registration for all the events, as recorded at the institute, totaled about 350 persons. The meetings were held in various buildings on the campus of the University of California at Los Angeles, where the Institute for Numerical Analysis is located.

The purposes of the Symposium on the Construction and Applications of Conformal Maps were to consider physical applications of conformal maps and their generalizations, and to study the construction of conformal maps with a view to determining the possible applicability of high speed electronic digital computing machines in this field. The symposium began on June 22 with a one-day course on programing for automatic computers given by the staff of the bureau's National Applied Mathematics Laboratories (of which the institute is one unit). This course was designed to acquaint those attending the later meetings of the symposium with the preparation of problems for automatic digital computing machines, and was especially arranged to appeal to mature mathematical analysts and applied mathematicians.

The morning of the second day was devoted to a general mathematical introduction in the form of addresses by Richard von Mises, of the Graduate School of Engineering of Harvard University, and Richard Courant, director of the Institute for Mathematics and Mechanics of New York University. J. H. Curtiss, of the National Bureau of Standards, was chairman of this meeting. Dr. von Mises gave a critical review of digital methods now available for constructing conformal maps. He strongly stressed one point which was of considerable interest to the persons in the audience concerned with machine development: In his opinion what is now really needed more than anything else in the field of high speed automatic computation is a machine which will solve very large systems of linear algebraic equations. He suggested in this connection that the speed of a proposed digital computing system should be measured in terms of the number of algebraic equations it can solve in a given length of time, rather than by its speed of multiplication. Dr. Courant's lecture was devoted to the conformal mapping of multiply connected regions, particularly as illustrated by flow patterns, and he touched upon the use of various analogue devices such as electrolytic tanks to calculate such maps.

The afternoon session, with D. V. Widder, of Harvard University, as chairman, was devoted to papers on physical and industrial applications of conformal mapping by G. Szegö, H. Poritsky, G. Stein, Ernst Weber, and I. S. Sokolnikoff. J. L. Barnes, of the University of California, Los Angeles, and North American Aviation, Inc., was chairman of the next morning session, which was concerned with fluid dynamics. Speakers were Alexander Weinstein, I. E. Garrick, Alexander Ostrowski, S. E. Warschawski, Andrew Vazsonyi, and E. P. Cooper.

Discussions of the theory of conformal maps occupied the next afternoon session. W. T. Martin, of Massachusetts Institute of Technology, was chairman and papers were presented by A. C. Schaeffer, D. C. Spencer, Stefan Bergman, Menahem Schiffer, Zeev Nehari, and P. R. Garabedian.

The general morning session with which the last day of the conformal mapping symposium opened was presided over by J. W. Green, of the University of California, Los Angeles. Papers were contributed by L. V. Ahlfors, L. Bers, P. C. Rosenbloom, G. Szegö, R. Isaacs, and M. Shiffman.

H. F. Bohnenblust, of California Institute of Technology, was chairman of the final afternoon session, devoted to numerical methods and additional notes. Speakers were Sir Richard Southwell, H. D. Huskey, D. M. Young, O. Laporte, H. Lewy, and L. H. Swinford.

The symposium was arranged by a committee of the Institute for Numerical Analysis under the chairmanship of Edwin F. Beckenbach. The role played by the Office of Naval Research in the proceedings was a significant one: a considerable number of the papers (e.g. those of Pólya and Szegö, Spencer and Schaeffer, Garabedian) arose from projects sponsored by ONR, and in fact the

[1] Proceedings of both symposia are being published by the National Bureau of Standards.

entire research group of the institute itself is also supported by ONR. Several interesting conclusions could be drawn from the symposium. In the first place, it seemed clear that there is a continuing interest in conformal mapping on the part of scientists working in the applications of mathematics, especially in electrical engineering and fluid dynamics. In the second place, it became evident that there was a need for a much more extensive catalog of conformal maps (given both analytically and in tabular form) than now exists. Finally it seemed apparent that digital techniques adaptable for automatic computing machinery are at present receiving little attention by those working in the field of conformal mapping, and extensive comparative studies of the relative usefulness of known methods and the newer probabilistic methods are now very much needed.

The Symposium on the Monte Carlo Method was arranged and sponsored jointly by the RAND Corporation of Santa Monica and the Institute for Numerical Analysis, with the cooperation of the Oak Ridge National Laboratory. Because the symposium dealt for the first time with an interesting branch of applied mathematics on which work hitherto has largely been carried on under a cloak of classification, the symposium attracted a considerable amount of attention, particularly from personnel of the laboratories of the Atomic Energy Commission.

The Monte Carlo Method can be described quite generally as the representation of a physical or mathematical system by a sampling operation satisfying the same probability laws as the system itself. Thus for example, the numerical integration of partial differential equations of a certain type can be accomplished by building up a large sample of trials of certain stochastic processes whose probability functions asymptotically satisfy the partial differential equations. In certain physical situations formerly represented by such equations, the physicist may prefer to place primary emphasis on the stochastic processes and the associated sampling operations, which he will then regard as new models to be used in place of the continuous models of classical applied mathematics.

The over-all plan of the Monte Carlo Symposium was evolved in conversations held by the committee on arrangements with J. von Neumann, of the Institute for Advanced Study.

An essential part of the plan was that a gallery of distinguished mathematical statisticians and experts in the analytic theory of probabilities would be present in the audience during the first two days, and that on the afternoon of the last day they would participate in a round table discussion at which the proceedings of the earlier sessions would be examined from the mathematician's and statistician's viewpoint.

After the introductory session on the morning of June 29, at which S. Ulam and J. von Neumann discussed the history of the Monte Carlo Method and outlined the areas in which it is being applied, some twelve papers covering current applications were given by the following scientists: Robert R. Wilson, B. I. Spinrad (a joint paper with G. H. Goertzel), A. S. Householder, Wendell DeMarcus (a joint paper with Lewis Nelson), Ugo Fano, Gilbert W. King, Maria Mayer, Preston Hammer, B. A. Shoor (a joint paper with Lewis Nelson, Wendell DeMarcus, and Robert L. Echols), and Herman Kahn (a joint paper with T. E. Harris). A paper by Lt. Williston Shor, U.S. N., was read by title. The sessions were under the chairmanship of J. von Neumann and Frank C. Hoyt.

A session on random digits was held on the afternoon of June 30 under the chairmanship of Jerzy Neyman, University of California. Three shorter papers were given first on the generation and testing of random digits by George W. Brown, Nicholas Metropolis, and George E. Forsythe. Dr. von Neumann then gave an interesting general discussion of the philosophy of random digits and of various possible techniques that could be used in generating them. One of the points he made was that any number used during the course of a computation in automatic digital computing machines ought to be the product of a reproducible routine, and from this point of view mathematically generated "pseudo-random" numbers and digits are to be preferred to random digits created by some sort of physical or mathematical "truly random" sampling process which takes place within the machine.

Both of the last day's sessions were under the chairmanship of John W. Tukey, of Princeton University. In the morning a mathematical session on the connection between stochastic processes and differential equations was held. William Feller first gave an informal general survey of the field. He was followed by J. L. Doob, who presented some recent results on stochastic differential equations, and then Mark Kac discussed certain results relating to the distributions of cumulative sums of random variable and differential equations. At the round table discussion in the afternoon of the last day it was emphasized that the method of sampling had long been used in the statistical field to solve difficult problems in distribution theory.

The symposium indicated that there are many interesting possibilities in the Monte Carlo method, particularly if it is used in connection with automatic digital computing machinery. The mathematicians of the Institute for Numerical Analysis concluded that the method is at present largely being employed by physicists as a rough tool of applied research to obtain results which can later be checked against experiment, and more attention now needs to be given by mathematicians to the theoretical aspects of the model considered in the light of the modern classical theory of stochastic processes. They also concluded that the use of the Monte Carlo Method as a technique for solving strictly mathematical problems, such as partial and ordinary differential equations, is in its infancy and much experimental numerical work as well as theoretical work must be done before the advantages of the method for a wide area of problems over the older deterministic methods of solution are established. The symposium also brought out once again that the modern classical analytic theory of probabilities is still a closed book to many mathematicians and physicists, and that there is urgent need for competent and well-organized exposition in the field.

International Conference on Instruments and Measurements

Edy Velander

Swedish Academy of Engineering Sciences, Stockholm

Three hundred fifty scientists and engineers from 16 different countries met September 21 at Stockholm, Sweden to take part in an international conference on instruments and measurements under the sponsorship of the Royal Swedish Academy of Engineering Sciences and the Association of Technical Physicists. Unesco was represented by an observer, R. Naidu. For four days papers were given and discussions were held in four parallel divisions: physical methods for the study of chemical structure, such as spectroscopy and X-rays; mechanical measurements; industrial control; and metrology.

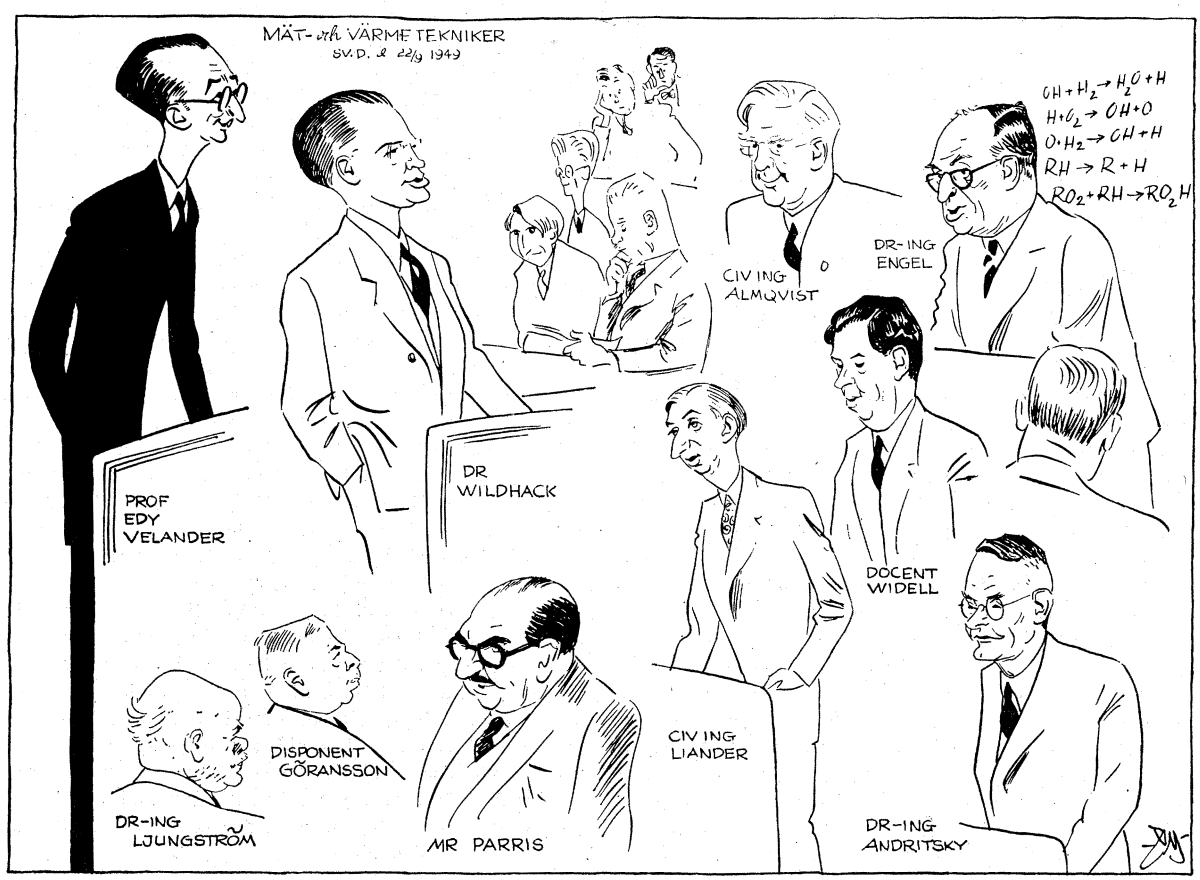
The conference was opened by Edy Velander, of the Swedish Academy of Engineering Sciences, and the opening lecture was made by W. E. Wildhack, of the U. S. National Bureau of Standards, who characterized instrumentation as the common denominator of the sciences. Instrumentation, he said, is the connecting horizontal link between the vertical divisions of science—chemistry, physics, biology, and the others. Mr. Wildhack also brought greetings from the Fourth National Instrument Conference and Exhibit in St. Louis, Missouri, sponsored by the Instrument Society of America.

In the spectroscopy division, A. C. Menzies, of Hilger and Watts, Ltd., London, talked on progress in Great Britain in infrared and Raman spectroscopy. Dr. Menzies described a new source for Raman spectroscopy which permits spectra suitable for qualitative work to be obtained with exposures measured in seconds, and spectra suitable for quantitative work in about a minute. Edy Velander

(Continued on page 383)

Photographs, 1, 3, and 5, opposite page — booths at the International Instruments and Measurement Exhibit, Stockholm (courtesy of Dagens Bild, Stockholm). Photographs 2 and 4—Raydist master recording station and continuous-wave transmitter, on display at the National Instrument Exhibit at St. Louis. Manufactured by the Hastings Instrument Company, Hampton, Virginia, for the Bureau of Ordnance, U. S. Navy, the Raydist automatically spots a vessel or any other object sending out radio waves in a given area. It measures distances up to 200 miles, unimpeded by mountains or tall buildings that intervene. Photograph 6, by Eugene Taylor, shows smoke density recorder dislpayed by the Bailey Meter Company, Cleveland, at the St. Louis Exhibit.

Sketches below, made at the Stockholm conference, are by Niles Melander.




ZEISS SVENSKA AKTIEBOLAG
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cuit. In our laboratory a Radiation Counter Laboratory Type 10A Beta-Ray Counter Tube obtained from Tracerlab, Boston, Massachusetts, having a glass wall of 30 mg/cm^2, or about 0.12 mm thick, is used. With the setup described, 3 μc of P^{32}, I^{131}, and Ra salts give a flash rate about twice background, at a source distance of 25 cm.

The OA4 tube was selected as it has characteristics that require small wattage for operation.

As the pulse sequence of the circuit is very short, having a duration of a few microseconds, the SN4 was selected for its very high illuminating intensity.

No attempt has been made to develop a quantitative measuring instrument, as the primary requisite is for detecting infinitesimal amounts of radioactive substances on clothing, hands, glassware, sinks, and counter tops around the laboratory.

(*Continued from page 352*)

summarized a paper by Van Lear and Long, describing an American commercial Raman spectrograph.

Other physical measurement methods were described by Madame Y. Cauchois, of the Laboratory of Physical Chemistry, Paris, who gave two papers—one on new developments of bent crystal techniques and one on curved crystal X-ray spectroscopy. In the same section A. Guinier, also from Paris, talked about demountable tubes and cameras for X-ray crystallography and some recent techniques in X-ray metallography.

Among the mechanical measurements discussed were two methods for photographic recording of ultrahigh speed phenomena by explosions, described by C. H. Johansson, of Detoniklaboratoriet, Stockholm. In one, instantaneous photographs are taken with an ordinary camera, using sparks or flash lamps as light source and a Schlieren apparatus. By repetition, lighting at successive time intervals being reckoned from the start of the explosion, quantitative measurements of the velocity at different stages of the occurrence can be made. Intervals from 2 to 500 microseconds are obtained by a detonation fuse. Other papers in this section included one by Robert Schnurmann, of the Manchester Oil Refinery, Ltd., England, on lubricant testing methods, and one by Pierre Piganiol, of the St. Gobain Company, Paris, on the measurement of the melt viscosity of plastic materials.

In the division of industrial control, R. S. Medlock, of the British firm George Kent, Ltd., spoke on the analysis of oxygen, based on its paramagnetic properties. With the exception of nitric oxide, oxygen appears to be the only strongly paramagnetic gas, and this affords a physical method of measurement. Other lectures included two by W. F. Hanson, of the Du Pont Company, and Maurice Surdin, chief of electrical construction services for the French Atomic Energy Commission.

Papers on metrology included one by Rene Yribarren, of Société d'Application de Metrologie Industrielle, Paris, who spoke on "Some Considerations About Accurate Fits." He described the contribution of the Solex air-operated method to the present problems of industrial metrology. All of the apparatus he described had the same object, he said—to incorporate inspection within the machining department, and to make measuring techniques formerly used for judging into guides for production. Other papers were read by A. Metz, of Ernst Leitz, Wetzlar, Germany, and Karel Veska, of Kovo Ltd., Prague, Czechoslovakia.

As part of the conference, a fairly large exhibit had been arranged, with a floor area of more than 30,000 square feet. Among the exhibitors were the French Atomic Energy Establishment, the French Defense Research Establishment, the German East Zone, and several of the main instrument manufacturing firms in Sweden. The greater part of the exhibit was commercial.

Perhaps the most interesting part of the exhibit was that arranged by the Swedish State Council of Technical Research in cooperation with the Academy of Engineering Sciences and the Association of Technical Physicists. Here was shown instrumentation research under way in Swedish institutions and laboratories. The committee on large computing machines showed parts from their project on a binary relay machine.

Other computing machines shown at the exhibit included an analogue computer for aircraft stability problems, an automatic recording Fourier synthesis apparatus, and parts from a mechanical differential analyzer with four integrating units, under construction at the Chalmers Institute of Technology.

New developments of direct-reading pH-meters, usable for all types of potentiometric measurements, and polarographs with a maximal sensitivity for full-scale diffraction of 0.0033 microamperes were shown by the Chemical Institution of the University of Upsala.

The Department of Telegraphy and Telephony at the Royal Institute of Technology had a wide range of apparatus, among which may be mentioned an automatic impedance meter for automatic recording of locus diagrams of networks within the range of 100 to 15,000 kilocycles per second, a heterodyne filter that can be used as a band-pass filter with continuously variable high and low frequency cutoff, that has an attenuation of 1 to 2 cycles per decibel.

In the field of electronics the Department of Electronics at the Royal Institute of Technology showed a 37-Mev synchrotron and a new development of the trochotron for pulse counting. The counting rate of a scale built with this new tube is 10 megacycles per second.

The Department of Electronics at Chalmers Institute of Technology showed experiments on radio wave propagation, a radar search for meteors, and the latest development in the traveling wave tube.

By special invitation, the U. S. National Bureau of Standards, the National Research Council of Canada, the RCA Research Laboratories and the Bell Telephone Laboratories had arranged booths in this part of the exhibit.