

The IEEE

Newsletter

The Magazine of the North Jersey Section

IEEE NEWSLETTER
North Jersey Section
P. O. Box 275, Morris Plains, N. J.

A P R I L 1 9 6 4

Volume 10 / Number 8

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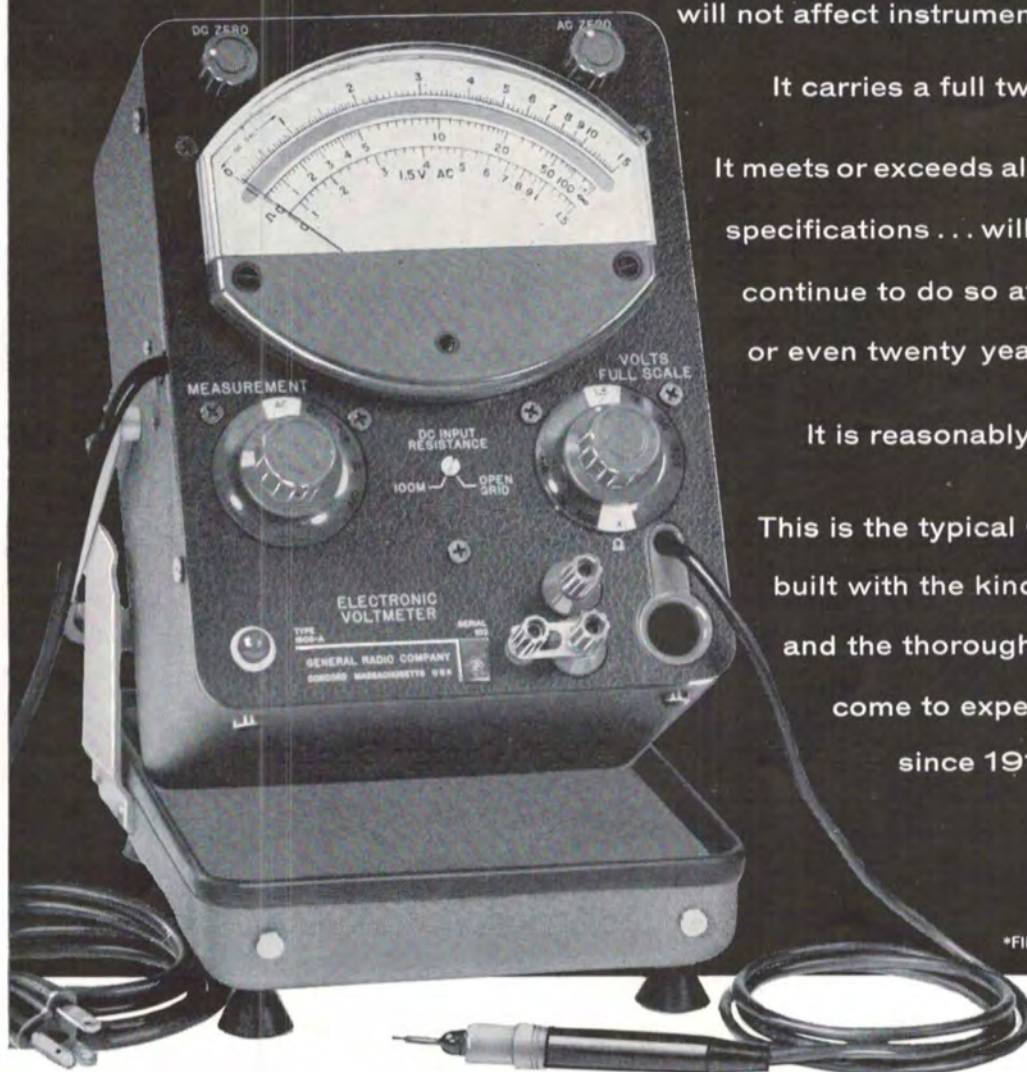
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LOCAL SERVICE AND REPAIR

For your convenience, the New York Office has a Service Department, manned by factory-trained service engineers. This Department can supply prompt and efficient repairs or recalibration of any G-R equipment. Considerable time can be saved by taking advantage of these facilities.

Editorial Notes

Antique? Mature? or Obsolete?

Are you becoming obsolete?

This is a startling question to put to a group that is engaged in a profession whose ideal is to drive forward. Some may feel that they are being dragged forward. Of course, this is a generalization like the slogan "Think", because no one really says what you should drive forward to or what to think about. Generalizations are dangerous, but on the other hand they do present a "goal."

Concretely, you can check your obsolescence by the kinds of problems you want to tackle. As an experienced engineer, you might prefer to make the empirical decision, rather than the rigorous mathematical or philosophical solution. Computers do lend themselves to the empirical rather than the rigorous solution. It is true that there are many times when the empirical approach results in a solution that works. However, if the approach had been more rigorous, the result would have been a more efficient, less costly, simpler product. In addition, it might not have been in need of extensive expensive repair and maintenance. You have seen examples of this kind.

Further, the articles appearing in publications may prove to be not quite intelligible because of different approaches or new concepts. The authors just don't seem to write English anymore, or so it seems. Of course, if you find that your colleagues no longer seek your advice, it could be a problem of interpersonal relations rather than a technical one. This approach, however, we'll leave to the research projects of psychologists and their finding will eventually filter through.

We are not saying you are obsolete, but to paraphrase George Orwell, some engineers are more obsolete than others.

CALENDAR

Monday, 13

PTG Reliability
Panel Discussion: Manufactured Product
Reliability Maintenance
7:45 P.M. — Sperry Rand Bldg.
1290 Avenue of the Americas (51 St.), N. Y.

Tuesday, 14

PTG CP & PEP
Physics of Semiconductor Failure
Dr. I. A. Lesk
8 P.M. — Barbizon-Plaza Hotel, N. Y.
6:30 P.M. — Pre-Meeting Buffet,
Barbizon-Plaza Hotel.

Wednesday, 15

Communications & Electronics Division
Communications on Laser Beam
Dr. Herbert Trotter, Jr.
7 P.M. — Rm. 110,
United Engineering Center
345 E. 47 St., N. Y.

Wednesday, 15

PTGEC — Panel Discussion:
Pictorialization of Computer Output
8 P.M. — Arnold Auditorium
Bell Telephone Laboratories
Murray Hill, N. J.
6 P.M. — Pre-Meeting Dinner
Wally's Tavern On-The-Hill

Thursday, 16

PTGEWS
"Electronic Publishing and the Engineer
M. M. Perugini, Editor
Mactier Publishing Co.
8 P.M. — Verona Public Library
6 P.M. — Pre-Meeting Dinner
Three Crowns, Montclair

Thursday, 16

PTGED
Microelectronic Technology
Dr. Edward M. Davis, Jr.
8 P.M. — ITT Labs., Nutley, N. J.

Tuesday, 21

Jointly Sponsored:
North Jersey Section and PTGCS
Symposium on Systems Engineering
7:45 P.M. — Garden State Plaza
Auditorium
5:45 P.M. — Pre-Meeting Dinner
Make Reservations
Cambridge Inn, Garden State Plaza

Wednesday, 22

PTGMTT
Microwave Industry,
Problems and Potentials
Theodore S. Saad
8:30 P.M. — Arnold Auditorium
Bell Telephone Laboratories
Murray Hill, N. J.
6:30 P.M. — Pre-Meeting Dinner
Wally's Tavern-on-the-Hill

Executive Committee Meetings

at Verona Public Library

April 1

May 6

June 3

The IEEE

Newsletter

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ABOUT ADDRESS CHANGES

It is not necessary to inform the North
Jersey Section when you change your mail-
ing address. The NEWSLETTER and other
section mailings use a list provided by
IEEE's national headquarters in New York.
This means the Section has no need to main-
tain a mailing list or addressing plates. Sec-
tion records of membership are changed
when Headquarters notifies us of any
change.

REPORT ALL ADDRESS CHANGES TO:
INSTITUTE OF ELECTRICAL AND ELECTRONICS
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**Measures True-RMS
regardless of
Waveform
and Voltage**

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Accuracy and
Resolution over
entire 5-inch scale**



Ballantine's new Model 340 is an extremely sensitive RF millivoltmeter designed for accurate True-RMS measurements with high resolution. Its 5-inch voltage scale spreads out the readings logarithmically so that you can make measurements to the same high resolution and accuracy at the bottom as at full scale. This advantage means that you can not only measure voltages accurately, regardless of waveform, but also calibrate the 340 using a signal source that may be far from sinusoidal. The new 340 is now available in both portable and rack versions.

SPECIFICATIONS

Voltage Range.....	300 μ V to 3 V	Crest Factor.....	100 to 3 depending on voltage range
Frequency Range.....	0.1 Mc to >1,000 Mc; calibrated to 700 Mc	Scales.....	Two logarithmic voltage scales, 0.95 to 3.3 and 3.0 to 10.6. One decibel scale, 0 to 10
Indication.....	True-RMS on all ranges, all voltages	Mean Square DC Output...	0.1 V to 1.0 V dc.
Accuracy....% of Reading		Internal resistance	20 kilohms. (For connection to recorder.)
	0.1 Mc — 100 Mc, 4%;		
	100 Mc — 700 Mc, 10%;		
	above 700 Mc as sensitive indicator		

*Accessories include a probe tip for in-circuit measurements, an adapter for connection to N or BNC, a T adapter for connection to a 50 ohm line, and a 40 db attenuator

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PTG Reliability

Meeting Notice

Date: Monday, April 13, 1964
Time: 7:45 P.M.
Place: Sperry Rand Building,
UNIVAC Classroom,
5th Floor
1290 Avenue of the Americas,
51st Street, New York City
Subject: The Maintenance of
Reliability in
Manufactured Product
(Panel Discussion)
Moderator: Mr. J. Ferraro
Panelists: Mr. G. Kaposhilin
Mr. W. Reidt
Mr. E. Shecter

Manufactured Product Reliability Maintenance

On April 13, 1964, the Metropolitan Chapter of the PTG on Reliability will hold a meeting starting at 7:45 P.M. at the Sperry Rand Building, 1290 Avenue of the Americas (51st Street), New York City, in the UNIVAC classroom on the fifth floor. The program for this meeting will be a panel discussion on "The Maintenance of Reliability in Manufactured Product". The panelists will be G. Kaposhilin, Airborne Instruments Laboratory, Cutler-Hammer; W. Reidt, Sperry Gyroscope Company; and E. Shecter, Radio Corporation of America. The session will be moderated by J. Ferraro, Sperry Gyroscope Company.

Abstract: In considering the maintenance of product reliability through the manufacturing phase, Mr. Kaposhilin will represent the Reliability Engineer whose interest extends throughout development, design, manufacture, testing, and inspection of the product. The point of view here is that reliability engineering has a responsibility at all stages of product evolution to insure that nothing is done to degrade reliability at any of these stages. Mr. Reidt, speaking for Manufacturing Engineering will stress the kind of production requirements which should be anticipated during product design such that production methods and processes do in fact sustain and perhaps augment reliability capabilities inherent in the design. Mr. Shecter will discuss the relationship of Quality Assurance to the reliability function and the manufacturing engineering function with particular reference to measures necessary to appraise, prevent and correct product deficiencies.

SYSTEMS ENGINEERING SYMPOSIUM

Meeting Facts

Subject: Symposium on Systems Engineering

Moderator: Dr. E. J. Baghdady

Panelists: Col. G. M. Adams
Mr. J. W. Halina
Mr. A. D. Hall
Mr. S. Sobleman

Date: Tuesday, April 21

Time: 7:45 P.M.

Place: Garden State Plaza Auditorium (Next to Bamberger's Basement)

Pre-meeting Dinner: 5:45 P.M. Cambridge Inn, Garden State Plaza

Dinner Reservations: Contact M. Westheimer at ITT Communication Systems Rte. 17, Paramus, N. J. 201 HU 9-7400 Ext. 4201 or G. Karger, same address Ext. 4253 Prior to April 15

PTGCS Chapter Officers for 1964-65 will be elected at this meeting.

In recent years it has become increasingly apparent that a crucial need exists for the development of a discipline of systems engineering. The systems may be for communication purposes, for integration of wide spread commercial or banking centers, for the coordination of a large scale program, or an industrial complex. Several attempts have been made to date to formulate a framework for the development of such a discipline. The purpose of this symposium on systems engineering is to bring together a num-

ber of specialists in various areas of systems engineering and attempt to develop from well-planned discussions and exchanges a consensus of views on (a) basic concepts, (b) methodology, and (c) application. An attempt will be made to evolve an outline for a formal course on the subject of systems engineering to be suggested to academic institutions for the training of people in this field.

E. J. Baghdady, President and Technical Director of ADCOM, Cambridge, Mass. will be moderator of the panel. The panelists will be J. W. Halina, Deputy to V.P. Engineering, ITT Communication Systems, Inc.; Col. George M. Adams, Chief, Defense Communication Engineering Office; Arthur D. Hall, Head, Broadband Systems Studies, Bell Telephone Labs.; Sidney Sobleman, Operations Research Specialist, Picatinny Arsenal.

Biographies

Dr. Elie J. Baghdady received a BA degree in 1951 from the American University of Beirut. Between 1951 and 1952 he attended the graduate division of electrical engineering of the Georgia Institute of Technology. He received the SM and ScD degrees in EE from M.I.T. in 1954 and 1956, respectively. He served on the electrical engineering faculty and research staff of M.I.T. between 1956 and 1962. In January of 1961 he was named Technical Director of ADCOM, Inc.,

a firm engaged in advanced research and development in communication theory and systems. In 1958 the Government of Lebanon awarded him the Lebanese Golden Medal of Distinction. He was the Editor of, and contributor to, the book "Lectures on Communication Systems Theory" and is the present editor of the PTG-CS Transactions.

Mr. Joseph W. Halina, Deputy to Vice President — Engineering, ITT Communication Systems, Paramus, N. J., has been closely identified with the communications engineering profession since 1939. Prior to his ITT experience, Mr. Halina occupied key engineering positions with several large communication companies specializing in telephone carrier, microwave radio relay and multiplex systems. He has lectured and written extensively and is a frequent contributor to professional engineering journals. A graduate of the University of Toronto with a BSEE, Mr. Halina is a member of the IEEE, the Association of Professional Engineers of Ontario and the Society for General Systems Research.

Col. George M. Adams, USAF, is currently Chief, Defense Communication

Engineering Office, Defense Communication Agency, Washington, D.C. Previously, he was Chief, Future Plans Division, Hq. Defense Communications Agency; Operations Officer Weapons Effects & Test Group, New Mexico, Nevada, Eniwetok, Bikini and Johnston Island; and has had other distinguished and important assignments. Col. Adams is a graduate of Indiana and George Washington Universities, and has attended a number of important Military Schools including Air War College.

Mr. Arthur D. Hall is Head of the Broadband Systems Studies Department of the Bell Telephone Laboratories in Murray Hill, New Jersey. He has been practicing systems engineering in the field of television transmission, videotelephone systems, and high speed PCM transmission systems and is author of the book, "A Methodology of Systems Engineering," published in 1962 by D. Van Nostrand Company.

Mr. S. Sobleman is a Research Specialist in the Management Science and Data Systems Office at Picatinny Arsenal, Dover, N. J. He currently is instructing a graduate course on Operations Research at Fairleigh Dickinson University. Mr. Sobleman is a graduate of CCNY and Stevens Institute with several degrees in engineering and operations research. He was the 1957 recipient of the Secretary of the Army's Research and Study Fellowship. He is President of the Armed Forces Management Association, Picatinny Chapter and holds membership in a number of other Professional Societies.

1964-65 Nominations

The Nominations Committee of the North Jersey Section of the IEEE presents the following slate of officers for 1964-65:

Chairman John Redmon
Vice Chairman Walter Glomb
Treasurer Stephen Mallard
Secretary J. W. Gordon
Members at Large .. John Van Duyne,
Roger McSweeney

Additional nominations may be made by presenting a petition signed by not less than twenty-five (25) voting members of the North Jersey Section to the Executive Committee not later than 1st of April. The petition must certify that the persons nominated have agreed to serve if elected.

Election of Officers will take place at the General Meeting in May unless the Executive Committee decides that a special ballot is required.



Executive Committee Report

Andy Paparozzi

Chairman, Education Committee, North Jersey Section

The Education Committee of the North Jersey Section of the IEEE traces its origin to the Education Committee formed in 1944 as a subcommittee of the New Jersey Division of the AIEE. Since that time the Education Committee has offered a wide diversity of study group educational sessions to the engineering community, varying from topics such as "Electrical Insulation in Power Apparatus" to the "Application of Digital Computers to System Problems."

The functions of the Education Committee are to originate, organize and conduct study groups on engineering topics not normally available through local educational institutions. Lecturers are solicited from among industry leaders who disseminate up-to-date information, both on existing industry practices and new concepts for the future.

At present, the Education Committee is comprised of 14 members. Business is conducted at monthly luncheon meetings, usually held in Newark. New committee members are welcome, particularly since original ideas on study group topics and a fresh viewpoint are necessary to continue the effectiveness of this committee.

A cordial invitation to participate in the Education Committee is extended to any section member interested in becoming active in a challenging and gratifying activity.

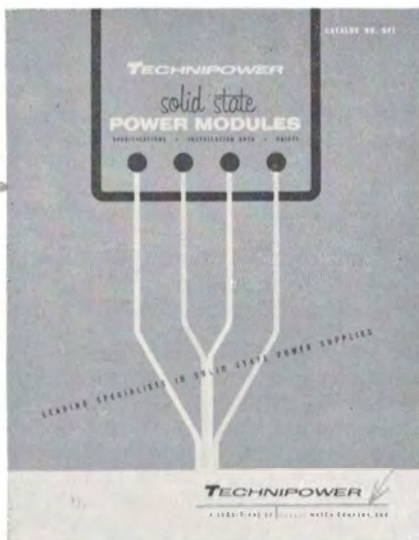
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Metropolitan Student Council

Announces the Tenth Annual Student Prize Paper Contest

The Metropolitan Student Council would like to encourage student members and members to attend the Student Activities Day to be held on Saturday, May 2, 1964 at City College of New York.

The schedule of the days events will be as follows:

- 1:00 — Registration
- 1:15 — Commencement
- 1:30 — Presentation of three papers
- 2:15 — Intermission
- 2:30 — Presentation of three papers
- 3:30 — Tour of City College of New York or question and answer period of the contestants
- 5:00 — Judges grade contestants
- 5:30 — Dinner
- 6:30 — Presentation of Awards.
- 6:45 — Guest Speaker —
R. W. Ketchledge

Mr. R. W. Ketchledge is the Director of the Electronic Switching Laboratory at Bell Telephone Laboratories. He received his BS and MS degrees in electrical engineering at Massachusetts Institute of Technology, in 1942. He has been associated with the development of a wide variety of communication systems and devices. His present responsibilities include the No. 1 Electronic Switching System, a new electronic telephone central office. Mr. Ketchledge has over 50 issued U. S. patents and is a senior member of IEEE.

The price of the entire day will be \$2.00 per person. Have your order in before April 15, 1964. When your order is received you will be sent a ticket and brochure describing the day and directions to City College. Students at Stevens, Newark College of Engineering and Fairleigh Dickinson University may obtain their tickets from their MSC Delegates.

Tickets may be obtained from:

Paul Christianson
Dept. of Electrical Engineering
Fairleigh Dickinson University
1000 River Road
Teaneck, New Jersey 07666

Make checks payable to:

New York Section IEEE

Enclosed is a check for \$..... for tickets for Student Activities Day on May 2, 1964.

Name
Address

Firm
Position
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PTG Engineering Writing and Speech

Electronic Publishing and the Engineer

Meeting Notice

Date: April 16th
Time: 8 P.M.
Place: Verona Library
Subject: Electronic Publishing
and the Engineer
Speaker: M. M. Perugini
**Pre-meeting
Dinner:** Three Crowns, Montclair



At the Thursday, April 16th meeting of the PTG on Engineering Writing and Speech, M. M. Perugini of Mactier Publishing Company will discuss "Electronic Publishing and the Engineer". The meeting, scheduled for 8 P.M. at the Verona Library, will follow a 6 P.M. dinner at the Three Crowns in Montclair.

Perugini, no stranger to readers of the NEWSLETTER, will draw on five years of experience to give the group's members some practical advice about writing for publication.

He intends to answer these and other questions:

Why are there so many electronic publications?

Why should an engineer take time to write for a trade publication?

How can you improve the chances of your article getting accepted?

Why are some magazines free, others paid?

How do free magazines manage to compete with paid ones?

North Jersey Section members know Perugini as last year's Editor of the NEWSLETTER. His present full time position is that of Editor of EEP-ELECTRONIC EVALUATION & PROCUREMENT. His experience includes three years as Associate Editor of Electronics where he co-authored a

special report on Microminiaturization which was translated into Japanese. Engineering positions include Central Office Engineer at Western Electric and work as a member of the electronics department of McGraw Edison's Central Research Laboratory in West Orange.

A graduate of Newark College of Engineering with a BSEE, Perugini also earned a MBA in Industrial Management from City College of N. Y. A member of the IEEE, he serves on the Registration Committee of the IEEE International Convention.



SYMPOSIUM:

In ancient Greece a drinking together; a comotation usually following the banquet proper, with music, singing, and conversation.

Only a light bulb can go out every night and still be bright the next day.

Give instruction to a wise man, and he will be yet wiser; teach a just man, and he will increase in learning.

— Proverbs, IX; 9

Don't always assume that the other fellow has equal intelligence. — He may have more.

A fool and his money are soon spotted.

The difference between the almost right and the right word is really a large matter — 'tis the difference between the lightning bug and the lightning.

— Mark Twain

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P.O. Box 403, Ridgewood, N. J.,
Phone (201) Gl. 5-5210

Do you suffer from . . .

Disserendipity?

Some two-hundred years ago Horace Walpole's tale, "The Three Princes of Serendip", enriched the English language with the word "Serendipity" — the facility for making a fortunate discovery while searching for something wholly unrelated.

Seeking to take our place among the immortals, we have coined a new term, the opposite (or perhaps the reciprocal) of serendipity:

Dis-ser-en-dip-i-ty — the aptitude for not finding something for which one is not looking. And in electronic engineering, as in other branches of human endeavor, disserendipity can prove very inconvenient.

Disserendipity at Work

A case in point is a recent incident in our own engineering lab.

During the development of a special modification of one of our capacitance bridges, the engineer suddenly encountered great difficulty in maintaining the balance of the bridge. Since comparable circuitry had performed admirably in several other bridge designs, the problem was wholly unexpected. The engineer meticulously checked all critical points with scope and VTVM, but, suffering from an acute attack of disserendipity, he failed utterly to find what he wasn't looking for.

RF Voltmeter to the Rescue

Finally in a flash of non-disserendipitic insight, he made a quick check with one of our Sensitive RF Voltmeters (the Model 91D to be specific) and found just what he was looking for — a 1-Mc buffer stage was oscillating merrily well up in the VHF region, to the considerable discomfort of the associated circuitry. The mesa transistor used in earlier versions had been replaced here by a newer silicon planar type having a far higher gain-bandwidth product. This, combined with lead capacitance and stray inductance, yielded the wholly uninvited RF oscillator, whose output was far beyond the frequency range of virtually all scopes and well below the sensitivity limits of VTVM's.

Once the RF Voltmeter had revealed the problem, it was promptly corrected, and everyone, including the capacitance bridge, lived happily ever after.

Conclusion

In the case of many of the newer transistor types which have a high f_T , such spurious high frequency oscillations are far from uncommon. Unless one is looking specifically for them with the right tool, they can prove elusive indeed.

Detection of these oscillations is an application for which our Sensitive RF Voltmeters, with their wide frequency range and very high sensitivity, are particularly well adapted. And all of this serves as another example of the importance of having one of our Sensitive RF Voltmeter on hand as a basic laboratory tool.

Our Sales engineer in your area will be happy to give you full details on our Sensitive RF Voltmeters and their applications, or to arrange a demonstration. Why not give him a call?

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PTG Power

New Chapter Organized

On Thursday, February 13, 1964, an organization meeting was held for the Professional Technical Group on Power Chapter of the North Jersey Section, IEEE at the Headquarters of Jersey Central-New Jersey Power & Light Company in Morristown. More than twenty people representing Federal Pacific Electric Company, Jersey Central-New Jersey Power & Light Company, Newark College of Engineering, Pennsylvania Transformer Company, Public Service Electric & Gas Company, and the Westinghouse Electric Corporation attended the meeting.

Interim Chairman of the North Jersey Chapter, Herb Blaicher, explained the details of the proposed National Constitution, By-laws, and Organization Chart. He also reported on the Open Forum on PTG-P which was held in conjunction with the 1964 Winter Power Meeting in New York City on February 3, 1964. There followed a spirited discussion of the plans for the organization of the North Jersey Chapter. Before adjourning, an organization committee was formed to determine the number of officers required for the local chapter, and to select a slate of candidates for those offices. Members of the committee include Herb Blaicher, Jersey Central-New Jersey Power & Light Company — Chairman, Jim Jones, Newark College of Engineering, Mel Nuechterlein, Public Service Electric & Gas Company, Paul Schwanenflugel, Westinghouse Electric Corporation, John Shimshock, Public Service Electric & Gas Company, Joe Skroski, Jersey Central-New Jersey Power & Light Company, and Carl Torell, Federal Pacific Electric Company. First meeting of the committee was held at 7:30 P.M., Thursday, February 27, 1964 at the Headquarters Building of Jersey Central-New Jersey Power & Light Company in Morristown.

Any IEEE member interested in serving on a committee of the new PTG-P Chapter should contact Herb Blaicher either by mail, or by phone at JE 9-6111, Extension 487.

Edison Medalist



John R. Pierce was born in Des Moines, Iowa, in 1910. He joined the Bell Telephone Laboratories in 1936 after receiving the PhD degree from California Institute of Technology. Dr. Pierce

is now Executive Director, Research — Communications Principles and Systems Divisions, with responsibility in such fields of research as radio, electronics, acoustics and vision, mathematics, computation, and psychology.

Dr. Pierce is the author of five technical books and many technical articles, and a few science fiction stories for various magazines. He has received the following awards: Eta Kappa Nu, 1942; Morris Liebmann Memorial Prize, 1947; Stuart Ballantine Medal, 1960; Air Force Association H. H. Arnold Trophy, 1962; the Golden Plate Award of the Academy of Achievement, 1962; the Arnold Air Society General Hoyt S. Vandenberg Trophy, 1963. He was awarded the following honorary degrees: D.Eng. from the Newark College of Engineering, 1961, D.Sc. from Northwestern University, 1961, D.Sc. from Yale University, 1963, D.Sc. from Polytechnic Institute of Brooklyn, 1963.

Dr. Pierce is a member of the National Academy of Sciences and the Air Force Association, and a Fellow of the American Academy of Arts and Sciences, the Institute of Electrical and Electronics Engineers, the American Physical Society, the Acoustical Society of America, the American Astronautical Society, and the British Interplanetary Society. He is a Kentucky Colonel.

W. R. G. Baker Prize Winner



Donald L. White was born in Minneapolis, Minnesota in 1929. He received his bachelor's degree in Applied Mathematics and Mechanics from the University of Wisconsin in 1952 and his PhD in

physics from the same university in 1956. He then joined the Bell Telephone Laboratories and worked on quartz crystals for frequency control for a couple of years. He soon became interested in ultrasonics and piezoelectricity in solids, especially the new materials constantly being synthesized by modern crystal growth methods. The availability of high resistivity semiconducting crystals which are also piezoelectric led to the invention of the depletion layer transducer, a new method of generating and detecting ultrasonic waves in the UHF region, and other thin semiconductor transducers, and then to the ultrasonic amplifier. He is currently working on the physics and device possibilities of ultrasonics in solid state physics.

The Newsletter, April 1964

NEW YORK SECTION, IEEE; COMMUNICATIONS & ELECTRONICS

Lectures on the Digital Computer as an Engineering Tool

A Spring Lecture Series on "The Digital Computer as an Engineering Tool" will be held during April and May by the Communication and Electronics Division of the New York Section, IEEE.

Courses will be given at the Western Union Auditorium, 160 Broadway, Manhattan, on six consecutive Mondays from 7 to 9 P.M. The area has adequate street parking after 6 P.M. and is easily reached by the IRT (Seventh Ave.) and IND subways.

Previous series on digital computers have emphasized design and technical criteria. The Spring lectures are planned to provide engineers and scientists with background on the capabilities of all sizes of computers ranging from the smallest to the largest commercially available products. Emphasis will be on the usefulness of digital computers in solving scientific and engineering problems. The series will include background information on programming as the engineer must understand it.

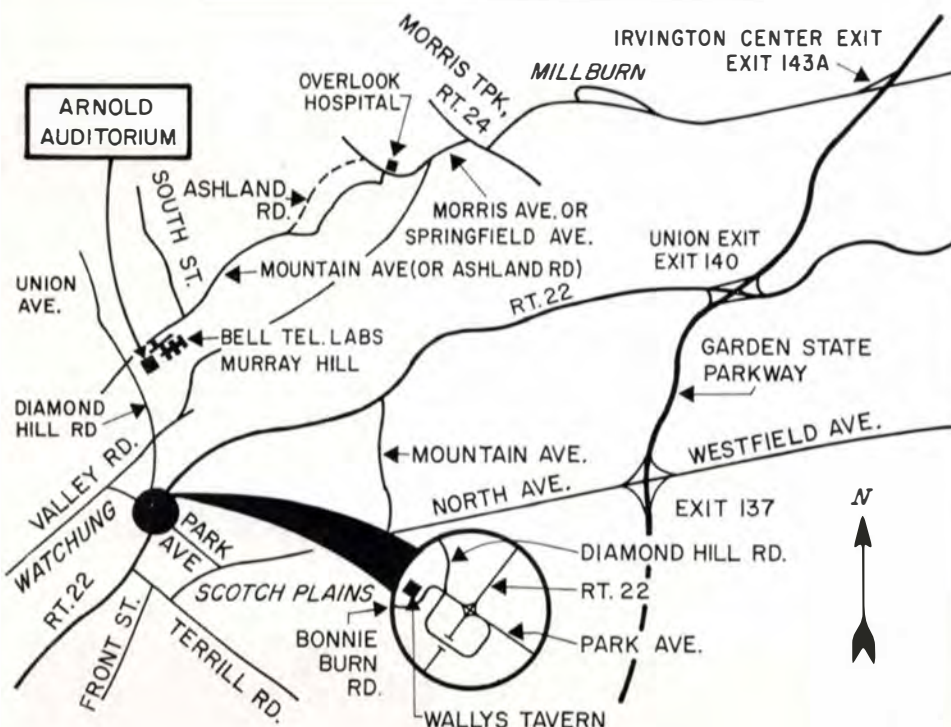
Lectures and lecturers are as follows:

- 1 — April 13, 1964
Survey — Application of Digital Computers to Engineering
Dr. Theodore R. Bashkow, Associate Professor, Columbia University
- 2 — April 20, 1964
Programming from an Engineers Point of View
Dr. Phillip M. Sherman, Bell Telephone Laboratories
- 3 — April 27, 1964
Engineering Applications of Small Computers
Gerald D. Fogel, Chief of Computing Services — Grumman Aircraft Corp.
- 4 — May 4, 1964
Range of Problems for a medium size computer
Ivan Francis, Univac Division — Sperry Rand Corp.
- 5 — May 11, 1964
Large Computer Applications
Dr. Wayne B. Swift, Vice President and Director CEIR Corp.
- 6 — May 18, 1964
Summary
Alvin H. Hatch, Manager Applied Programming Dept. Sylvania Corp.

Registration Information:

Fee for the series is \$5.00 for members of the IEEE; \$8.00 for non-members; and \$1.00 for full-time students.

Registration should be made in advance. To register, send check payable to "Communication & Electronic Division, New York Section IEEE" to F. D. Sellinger, American District Telegraph Co., 155 Sixth Avenue, New York 13, N. Y.



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282	0 to 500	0 to 100	5 mv	.01%	.02%
285	0 to 1500	0 to 150	10 mv	.01%	.02%
287	0 to 3500	0 to 50	15 mv	.005%	.006%
270	0 to 5000	0 to 50	20 mv	.002%	.006%
271	0 to 5000	0 to 150	30 mv	.002%	.006%



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PTG Electronic Computers

Pictorialization of Computer Output

Meeting Notice
Subject: Pictorial Display of Computer Outputs
Speakers: Miss R. A. Weiss
 Mr. K. C. Knowlton
 Mr. J. V. Kane
 Mr. E. E. Zajac
 all of Bell Telephone Laboratories, Murray Hill, New Jersey
Date: Wednesday, April 15, 1964
Place: Arnold Auditorium, Bell Telephone Laboratories, Murray Hill, New Jersey
Time: 8 P.M.
Pre-meeting 6 P.M. at
Dinner: Wally's Tavern On-The-Hill, Bonnie Burn Road, Watchung

Reservations can be made through April 14 by calling Miss R. H. Weitz, TU 7-1000, Ext. 3379. Map on Page 9.

This program, which might be subtitled "Wednesday Night at the Movies", will present four aspects of computer generated visual displays. The overall theme will be "One picture is worth ten thousand words — of computer printout". The speakers will describe several methods of producing moving pictures by computer and of using these displays to simplify the visualization of scientific problems. Each talk will be illustrated with slides or movies.

Miss Weiss will describe a programming method for generating orthographic perspective views of plane and quadric surfaces as seen from various directions. The outputs are drawings on the General Dynamics SO-4020 microfilm recorder.

Mr. Knowlton will demonstrate a programming language for production of animated movies. These economical movies can be used for psychophysical experiments, educational films or display of simulation results.

Mr. Kane will show how a real-time cathode ray tube output on a small computer is used to perform physics experiments, comparing experimental nuclear cross-sections with theory. Each picture is equivalent to 4000 numbers.

Mr. Zajac will describe the application of perspective movies to a study of the angular motions of an earth satellite containing an attitude control system as it rotates in orbit around the earth.

PTG Microwave Theory And Technique

Microwave Industry Problem and Potential

Meeting Notice
Subject: The Microwave Industry, Its Problems and its Potential
Speaker: Theodore S. Saad, Sage Laboratories, Mass.
Meeting: 8:30 P.M., April 22, 1964
 Arnold Auditorium
 Bell Telephone Laboratories, Inc., Murray Hill, New Jersey
Dinner: Wally's Tavern On-The-Hill
 See Map on Page 9.



On the evening of April 22, 1964, The North Jersey Chapter of the PTGMMT will present as its guest speaker Theodore S. Saad who will discuss "The Microwave Industry, Its Problems and Its Potential". The meeting will be held in the Arnold Auditorium at Bell Telephone Laboratories, Inc., Murray Hill, New Jersey at 8:30 P.M. The pre-meeting dinner will be at Wally's Tavern On-The-Hill at 6:30 P.M.

In addition to his duties as president of Sage Laboratories, Mr. Saad is editor-in-chief of **The Microwave Journal** and of **Solid State Design**. He is a past chairman of the National Administrative Committee of the PTGMMT and currently serves on that committee. He has been active in the microwave industry since 1942 when he joined the Radiation Laboratory at MIT, and his breadth of experience uniquely qualifies him as a leading spokesman for microwave people and companies.

In this increasingly technological era the microwave industry is one of the basic assets possessed by the United States. Basic though it may be, the industry is not without its problems. There has been recently a growing awareness and concern for these problems, and this has been reflected in the conversations of engineers in the industry and in the price trends of microwave company stocks. Mr. Saad has studied closely the nature of these problems and has stimulated the

industry to take action regarding them. Recognizing the major consuming role played by the Department of Defense, last June together with William L. Bazzy, he led a group of industry executives in a discussion of the problem areas with Dr. Eugene Fubini, Deputy Director of the Defense Department Research and Information Systems. The areas covered included levels of DOD spending, recent changes in procurement policies that are a source of industry concern, questions of interpretation concerning these policies, and the apparent shift of microwave business from smaller component R&D manufacturing companies to major systems contractors.

In addition, Mr. Saad has examined in detail the international aspects of the microwave business and has reported on them frequently in **The Microwave Journal**. He is thus able to bring us a comprehensive picture of the industry as it exists today and an extremely well informed opinion about the changes it may experience.

Since this will be the final meeting of the season, the matter of new officers will be taken up. Volunteers to assist in managing the chapter's activities will be warmly received.

The common law of business balance prohibits paying a little and getting a lot — it can't be done. If you deal with the lowest bidder, it is well to add something for the risk you run. And if you do that, you will have enough to pay for something better.

— John Ruskin

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PTG

Automatic Control

PTGAC Officers Nominated

The nominating committee of the North Jersey Chapter of the PTG on Automatic Control has nominated the following slate of officers for 1964-65:

Chairman Dr. A. U. Meyer
Vice-Chairman R. G. Sokalski
Secretary L. E. Sutton, III

All PTGAC members will have an opportunity to vote for these three positions on the Executive Committee. The new term of office starts in July 1964.

C. J. RYVA
Chairman,
Nominating Committee

Andrew U. Meyer —

Nominee for Chairman

Dr. Meyer, a member of the Technical Staff of Bell Telephone Laboratories, Whippany, New Jersey since October 1961, is conducting research in the areas of automatic control, missile guidance, and satellite attitude control. He commenced his undergraduate training in Germany and attended Northwestern University from which he received his MS in 1958 and his PhD in 1961, both in electrical engineering. Dr. Meyer is a member of Sigma Xi, Eta Kappa Nu, and the IEEE. Presently, he is Vice-Chairman of the N. J. Chapter of the PTGAC.

Microwave Field and Network Techniques

June 1 through 5, 1964
The Graduate Center,
Farmingdale

The Polytechnic Institute of Brooklyn will present a short course, "Microwave Field and Network Techniques" at the Graduate Center, Farmingdale, Long Island, during the week of June 1-5.

The very significant research and engineering progress that has been associated with Microwave Phenomena has stemmed largely from the continuing development of new and powerful techniques. This course will focus on the understanding of basic physical concepts through the utilization of these modern techniques including network synthesis, mathematical and physical modeling, and problem simplification. Illustrative examples, engineering applications and problems will be stressed.

The topics to be covered include:

Quasi-Optic Diffraction

Prof. Leopold B. Felsen

Waves in Compressible Plasmas

Assoc. Prof. Jerry Shmoy

Waves Along Smooth Open Structures

Asst. Prof. Theodor Tamir

Robert G. Sokalski — Nominee for Vice-Chairman

Mr. Sokalski received his BS degree from Stevens Institute of Technology where he majored in mathematics. He is currently employed by Kay Electric Company as an electronics engineer. Mr. Sokalski has been active in helping form the North Jersey Chapter of the PTGAC, serving as a member of the executive committee, as head of the first election committee, as head of the workshop committee, and as secretary. Mr. Sokalski is a member of the IEEE, PTGAC, and PTGIM.

L. E. Sutton, III — Nominee for Secretary

L. E. Sutton, III received the ME degree from the Stevens Institute of Technology in 1948, and has since taken graduate courses at Columbia University and Stevens as well as special courses given by Massachusetts Institute of Technology. He joined Gibbs and Cox, Inc. in 1948 where he has been engaged in research and development in connection with surface ships and hydrofoil research craft. Presently he is Head of the Scientific Section of the Electrical Division of Gibbs and Cox. He is a member of both PTGAC and PTGEC since 1958 and Charter member of the NJ Chapter of PTGAC serving on the Executive Committee and as treasurer.

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Prof. Arthur A. Oliner

Oversized Guides and

Multi-mode Techniques

Prof. John W. E. Griemsmann

Wave Guide Junctions

Assoc. Prof. Walter K. Kahn

Network Synthesis With Transmission Line Elements

Prof. Herbert J. Carlin

Analysis and Synthesis of Non Uniform Lines

Assoc. Prof. Dante C. Youla

Dr. Herbert J. Carlin, Head Electrophysics, Polytechnic Institute of Brooklyn, and the senior research personnel of his Department that constitute the faculty have published nearly 200 papers in the broad domain of electrophysics research.

Special notes developed by the faculty will form the structure around which the course will be taught. Participants will be expected to be conversant with Electromagnetic Theory, Microwave Network Analysis and Complex Functions. The registration fee for the course, which includes the notes and special luncheons, is \$200.00.

For further information contact:

G. E. Moore, Director

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PTG Electron Devices

Microelectronic Technology



A talk on "Low Cost Microelectronics Technology" will be presented by Dr. Edward M. Davis, Jr. at the next meeting of the N. Y. Metropolitan PTG

on Electron Devices.

The meeting will be held on Thursday, April 16, 1964 at 8:00 P.M. at the International Telephone and Telegraph Laboratories, Nutley, N. J.

Microelectronic circuits have become increasingly important because of their application in spacecraft where size and weight must be minimized. In addition, the increasing complexity of modern computers has increased the demand for microminiaturized circuits. Up until the present time, microelectronic circuits have been expensive to make and difficult to interconnect. Flexibility of the units has been limited, and thermal dissipation has been a serious problem. This paper describes a new integrated circuit module technology that significantly reduces these problems.

The salient features of this new technology are as follows:

1. Semiconductor elements are interconnected without the use of thermal compression bonding. A soldering process is employed to join multiple "chip" diodes and transistors of a particular form factor to a substrate containing passive components.



2. These multiple semiconductor devices are protected by a glassing process, thereby eliminating the necessity for a hermetically sealed package.
3. Graphic arts techniques are used to produce high quality passive components (resistors, capacitors, and inductors) with close tolerances (1% resistors; 5% capacitors). As with the semiconductor elements, these devices do not require a hermetically sealed enclosure.
4. Thermal difficulties are minimized through the use of:
 - a. Materials and configurations with low thermal resistance, and
 - b. High tolerance circuit components which reduce the power required to perform a circuit function.

The speaker will present the design criteria for these integrated circuit modules, fabrication techniques, examples of circuit functions, and typical performance results.

The Speaker

Edward M. Davis, Jr. was born in 1933. He obtained the BS degree in electrical engineering from Carnegie Institute of Technology. In 1958 he received an MSEE from California Institute of Technology. In 1956 he obtained a PhD degree from Stanford University in electrical engineering.

Prior to joining IBM in 1958, Mr. Davis worked as a Research Assistant at Stanford Electronics Laboratory. He is currently Project Engineer, Manager of Integrated Circuit Module Development at the IBM Components Division.

Mr. Davis has authored several IBM technical papers and has numerous patents related to semiconductor device development.

He is a member of IEEE, Sigma Xi-Eta Kappa Nu, and Tau Beta Pi.

Appointment of Robert F. Stewart as vice-president and general manager of Airtron, a division of Litton Industries, Morris Plains, N. J., has been announced by Harry J. Gray, Litton vice-president and chairman of the Components Group.

Stewart formerly was president and general manager of the Gabriel Electronics division of Maremont Corp. He is a graduate of Worcester Polytechnic Institute and Babson Institute of Business Administration.

PTG Component Parts

MEETING NOTICE

DATE: April 14, 1964
TIME: 6:30 P.M.
PLACE: Barbizon Plaza, New York
SUBJECT: The Physics of Semiconductor Failures
SPEAKER: Dr. I. A. Lesk

6:30 P.M. to 7:45 P.M. — Motorola and Schweber Electronics invite you to attend a pre-meeting buffet at the Barbizon Plaza, Central Park South, New York City.

8:00 P.M. — A talk and question period on "The Physics of Semiconductor Failures".

Subject: A failure in a semiconductor component ranges from characteristics that have changed so that they are outside a predetermined specification limit, all the way to catastrophic events, such as melting together several components of the system. Catastrophic failures occurring at high powers are becoming better controlled as their mechanisms are better understood. Slow changes (which can eventually lead to catastrophe) occur due to bulk semiconductor, surface, and metallurgical effects, often in combination. A better understanding and control of the bulk and metallurgical factors now permits study of the surface factors at the high stress levels necessary for their acceleration. Surface failure modes are often reversible. Different problems and solutions have arisen concerning failures in devices fabricated, passivated, and packaged in different ways, and in integrated circuits.

Speaker: Prior to joining Motorola, Dr. Lesk held several positions with General Electric Co.

Sponsored by: This is part of a series on "Physics of Failure" of the Metropolitan New York Chapter of the Component Parts Group and PTGPEP.

Guests are Cordially Invited

It's unwise to pay too much . . . but it's worse to pay too little. When you pay too much, you lose a little money . . . this is all. When you pay too little, you sometimes lose everything, because the thing you bought was incapable of doing the thing it was bought to do.

Society for Advancement of Management

All Day Seminar Increasing the Productivity of the Research and Engineering Function

The theme of this seminar is to make available to interested management and technical personnel, some of the latest techniques that have been found to improve the research and engineering activities. These techniques will be applied to both large and small projects.

Papers:

Project Selection and Planning

C. P. Smith, Director, Process Research and Development, David Sarnoff Labs. RCA

Project Evaluation

R. T. Wilson, Manager, Control Research Labs., U. S. Rubber Co.

Operations Research in Research and Engineering

F. O'Reilly, Advisory Engineer, Data Systems Div., IBM

Maximizing the Effectiveness of Computers in Research

R. W. Hamming, Consultant, Head Mathematical Planning Dept., Bell Telephone Laboratories, Inc.

Maximizing the Effectiveness of Computers in Development and Engineering

E. P. Zselezky, Section Head, Applied Mathematics Div., Esso Research and Engineering Co.

Time: 9 A.M. to 4 P.M.

Date: Thursday, April 16, 1964

Place: Hotel Essex House
Broad St., Newark, N. J.

Fee: \$20 (Includes Lunch and Seminar Materials)

Mail Check with name to:

Prof. Carl Wolf
Industrial and Management Dept.
Newark College of Engineering
323 High St., Newark, N. J.

PTG

Component Parts

Connector Failure Physics

Meeting Notice

Date: May 5, 1964

Time: 6:30 P.M.

Place: The Island Inn,
Old Country Road,
Westbury, Long Island,
(Cumberland Room)

Subject: Physics of Failure
in Connectors

Speaker: Mr. Roland B. Lawrence

PROGRAM

6:30 P.M. to 7:45 P.M. — The Deutsch Company invites you to attend a pre-meeting buffet, at the Island Inn, Old Country Road, Westbury, Long Island, (Cumberland Room).

REGISTRATION FORM

If you plan to attend, please return coupon before *April 24, 1964*, to Mr. George Krygier, Sperry Gyroscope Company, Information & Communications Division, 155 Glen Cove Road, Carle Place, N. Y. PI 6-8600, X359.

I will attend the Metropolitan New York Chapter Meeting of the Professional Technical Group on Component Parts on May 5, 1964, sponsored by the Deutsch Electronic Components Division on Physics of Failure in Connectors.

FROM:

Name

Company

Affiliation

Address

8:00 P.M. — A talk and question period on the Physics of Failure in Connectors.

Subject: Mr. Roland Lawrence will present a discussion and laboratory equipment will be available to give a demonstration showing the catastrophic effect of connector performance under various extreme environmental conditions. The demonstration will include the effects at high altitude, high temperature, cryogenic temperatures, arc resistance, Silicon vs. Neoprene, contact retention, and interfacial seal. Included will be a discussion on contact design criteria for electrical connectors, including subminiature types as well as the new Deutsch developed floating plate concept.

The demonstrations are intended to increase the observers' general knowledge of connectors, as well as pointers on connector design and material criteria during the discussion.

Speaker: Mr. Roland B. Lawrence had more than 20 years of experience in the electronic and electrical systems engineering field prior to joining the Deutsch Company as Director of Engineering and Research in 1959.

Mr. Lawrence is a professional engineer, and is a member of several societies and industry groups including the Electronic Industries Association, The Aerospace Electrical Society, The Society of Automotive Engineers and The American Management Association.

Today, as Vice President for Engineering and Research of the Deutsch Company's Electronic Components Division, Mr. Lawrence heads one of the largest groups in the world devoted exclusively to the development of materials, designs and products in the field of terminations and interconnection devices.

This will conclude the PTGCP series on Physics of Failures of Components.

GUESTS ARE CORDIALLY INVITED

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Communications On A Laser Beam

A meeting of the Communications and Electronics Division will be held at 7 P.M. Wednesday, April 15, in Room 110 of the United Engineering Center, 345 East 47th Street, N. Y.

"Communications on a Laser Beam" is the topic of the evening and the guest speaker is Dr. Herbert Trotter, Jr., Chairman of the Board of General Telephone & Electronics Labs Inc.

The discovery of the Laser has added a new and startling dimension to the field of information transmission. At a frequency of 500 million megacycles such a beam has a transmission capacity of twenty million television channels. While a number of problems remain to be solved before this becomes a reality, Lasers bring to light beams the broad possibilities for the transmission of information that exist in coherent radio and microwave beams.

Lasers may also prove to be a very good means of communications in outer space since the light beam emitted is extremely parallel and diverges very little over considerable distances. A recent test showed that a beam from the earth to the moon was less than five miles in diameter compared with five hundred miles for the best microwave system.

In his presentation Dr. Trotter will use portable equipment to simultaneously transmit two sound channels over a laser beam. The resulting stereophonic sound thus uses the Laser beam for the information transmission connection. The Laser demonstrated will be of the continuous gas type, but others, such as the high-powered pulsed ruby laser, liquid laser and the Gallium Arsenide junction laser will be discussed. The discussion will include the use of the laser in the making of highly precise linear measurements.

Dr. Trotter will show that in research on lasers the combination of many fields is required to make progress; for example, optics, atomic physics, microwaves and electronics. The expected large audience for this meeting will also hear how the application of the enormous background of technical knowledge in these allied fields has resulted in the extremely rapid advance of our knowledge of the laser.

Dr. Herbert Trotter, Jr., is Chairman of the Board of General Telephone & Electronics Laboratories Incorporated. Prior to his election as Chairman of GT&E Laboratories, Dr. Trotter was President of the organization from December, 1959 to November, 1962. Previously he was Senior Vice President — Engineering and Research of Sylvania Electric Products Inc., now a subsidiary of General Telephone and Electronics.

Dr. Trotter was elected a National Vice President of the Armed Forces Communications & Electronics Association (AFCEA) in June, 1963.

A native of Woodstock, Va., Dr. Trotter was graduated from Hampden-Sydney College, and received a PhD in Physics from the University of Virginia.

Dr. Trotter is a member of the American Physical Society, the Institute of Radio Engineers, and Sigma Xi, national scientific

fraternity. He was awarded a Presidential Certificate of Merit for his work on the V-T fuze during World War II.

1964 PTGMTT International Symposium May 19-21, 1964

Dr. Ernst Weber, President of the Polytechnic Institute of Brooklyn, will be the Keynote Speaker at the 1964 PTGMTT International Symposium on May 19, 1964, to be held at International Hotel, John F. Kennedy International Airport, L. I., N. Y.

In his address which is entitled: "The Era of Microwaves," he will emphasize that the practical utilization of microwaves has ushered in a new era in radio engineering that has culminated in global communication systems, has restructured electrical engineering education, and has collected creative talents into the profession to make it the fastest growing of all disciplines of engineering. When Heinrich Hertz, as a pure physicist, wanted to demonstrate the wave nature of electromagnetic field propagation, he used near-microwave frequencies because of their quasi-optical behavior. Today, microwaves form the tangible link between classical radio engineering and optical data processing in the broadcast sense.

Dr. Weber is a Fellow of the IEEE and the American Physical Society. He is a member of the American Association for Advancement of Science, the American Mathematical Society, New York Academy of Science, and American Society for Engineering Education. He is a Past President of the IRE (1959) and was the first President of IEEE in 1963.

CHANGES SUGGESTED IN ENGINEERING CURRICULA

A change in the so-called "engineering-science" college curricula to more "pragmatic orientation" was suggested at the Winter Power Meeting of the Institute of Electrical and Electronics Engineers (IEEE) at the Statler-Hilton Hotel, New York.

The changes were outlined by J. W. Rittenhouse, of the Hi-Voltage Equipment Company, Cleveland, in a paper, Engineering Education at a Crossroad.

World War II, federal subsidy of engineering education and industry's lack of interest in the Engineering Council for Professional Development were held responsible for "a massive migration of engineering curricula from what some educators call the pragmatic orientation of the past toward what might be termed a basic sciences orientation of the future," he observed.

"In the path of this migration the heavy concentration of on-campus effort must be, we are told, in the area of teaching the student 'how to think.' Responsibility for teaching the students 'what to think about', it is alleged, does not rest with the college campus."

Mr. Rittenhouse said that "in our press to get our teaching job done and recruit faculty, most engineering colleges have been adding young inexperienced PhD's to do the bulk of the graduate level teaching in order to qualify as having acceptable programs." These teachers often have had no contact with "real engineering problems". "In truth, each of them is sometimes a second rate engineer and a second-rate scientist who then begins to turn out PhD's at his own level. About three or four generations down the line, the product is no longer an engineer."

The practice of tailoring staff to load requirements "is certainly not an undesirable one," he said. "It is precisely the practice of industry; so until industry complaints regarding the products of engineering curricula are matched by adequately financed programs to modify curricula and staff content trends the educators are perfectly right in pursuing the courses which they have chartered for themselves in the absence of adequate guidance from industry-oriented minds and subsidies."

Mr. Rittenhouse said his paper did not take a stand on whether changes in engineering curricula were needed, and disclaimed criticism of educators, but outlined three steps that could be taken to alter curricula: working through existing media, ECPD, American Society for Engineering Education, professional societies' education committees, etc.; "A gentle process of infiltration" through financing and sponsoring chairs of engineering in specific areas of interest, and establishing one or more colleges of engineering, "financed by industry to do the kind of engineering teaching that the sponsoring group desires."

The last approach "could be completely compatible with the program of ECPD, and in no way does it need to evoke argument with existing accreditation practices."

"Whatever one's personal opinions may be, it is believed undeniable that massive changes have been in process for many years. Whether these are good or bad is a matter of opinion. It is believed unfortunate though that so many decisions have been made without the benefit of the judgments of the large majority of our profession which is represented by the engineers in industry."



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*for accurate, reliable measurements
... even in difficult environments.*

The type 647 Oscilloscope and plug-in units add new convenience to display and measurement of high sensitivity, wide-band, dual trace applications.

Adaptable and versatile, the oscilloscope retains accuracy, within stated specifications, under extensive temperature variations . . . fluctuating line voltages . . . difficult conditions.



TEMPERATURE

Non-Operating —55°C to +75°C. Operating —30°C to +65°C.



SHOCK

Non-Operating 20 G's max, 2 shocks, each direction, along each of 3 major axes.



HUMIDITY

Non-Operating meets Mil-Std-202B, Method 106A, except freezing, vibration, through 5 cycles (120 hours).



VIBRATION

Non-Operating or Operating 0.025" pk-pk, 10-55-10 cycles, (4 G's max), 1 min cycles, 15 min each major axis.



ALTITUDE

Non-Operating 50,000 ft. Operating 15,000 ft. 50-to-400 cps line freq.

Type 647 Features

with 10A2 and 11B2
Plug-In Units

100 v—130 v line voltage. No calibration changes with line fluctuations. 50-to-400 cps line frequency. Low power—185 watts, approximately. Convection cooled—no fan needed.

Dual-trace operation. 10 mv/cm sensitivity. Dc-to->50 Mc passband. Less than 7-nsec risetime.

6-cm by 10-cm display area. Internal, no-parallax graticule. Controllable graticule illumination. 14-kv accelerating potential.

Bright line automatic triggering. $\div 10$ external trigger attenuator, (on main time-base triggering). 'Ground' input positions on each vertical channel.

2 time bases, independent triggering. Sweep rates to 0.1 μ sec/cm. 10X sweep magnifier.

Sweep delay 50 sec to 1 μ sec. Single-sweep operation. Wideband (>50 Mc) triggering. External horizontal input.

1-kc voltage calibrator, (crystal controlled). Push-button trace finder. Dc-coupled Z-axis amplifier. Current-probe calibrator.

Type 647 Oscilloscope \$1225
(without plug-ins)

Type 10A2 Dual-Trace Unit \$675

Type 11B2 Time-Base Unit \$825

2 P6008 Probes \$ 70

U. S. Sales Prices f.o.b. Beaverton, Oregon

Dual-trace display shows input and output pulses of an amplifier at 10 nsec/cm— with trigger source from channel 2 only, for convenient and accurate time relationship between traces. Upper trace is amplifier output. Lower trace is applied step function.

**FOR MORE INFORMATION—OR TO
ARRANGE A DEMONSTRATION—
PLEASE CALL YOUR TEKTRONIX
FIELD ENGINEER.**

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NEW INSTRUMENTS



MODEL 188A
DUAL TRACE
VERTICAL
AMPLIFIER

hp 4 GC DUAL-TRACE 'SCOPE AMPLIFIER

Features combined in Hewlett-Packard's new Model 188A dual-channel plug-in vertical oscilloscope amplifier:

- ✓ 90 picosecond rise time,
- ✓ 1 mv/cm calibrated sensitivity,
- ✓ A unique bridging sampler input system.

This new 'scope amplifier is for **hp** Model 185A and 185B oscilloscopes.

The bridging sampler permits signals to pass through the oscilloscope for analysis without attenuation, and without necessarily terminating or loading the system under test. To accomplish this, high impedance samplers in the amplifier are bridged across the 50-ohm lines between input and output terminals of each channel.

"Smoothed" response, automatic on the 3 lower ranges, effectively reduces noise without degrading bandwidth. Time difference between channels is less than 20 picoseconds, insuring accurate phase measurements of fast signals.

hp Model 188A vertical amplifier is priced at \$1500 . . . and it's available from stock.



DYMEC DY-2401B
INTEGRATING DIGITAL VOLTMETER

DYMEC DIGITAL VOLTMETER MEASURES THROUGH NOISE ON SIGNAL

Dymec's DY-2401B Integrating Digital Voltmeter eliminates the effects of noise on the measured signal. It features optional automatic ranging plus 6 digit resolution. Some DY-2401B specs:

- It provides greater than 140 db effective common mode rejection at all noise frequencies including dc.
- Five dc measuring ranges include an 0.1 and 1 volt range and 300% overranging is provided on the 4 lower ranges.
- All functions are programmable.
- An internal calibration source provides $\pm 0.01\%$ / six months stability.

The DY-2401B Integrating Digital Voltmeter combines floated and guarded measuring circuitry with an active integrating technique which provides the average reading of the input over a crystal-controlled sample period.

Frequency measurements up to 300 KC can be made with the standard DY-2401B . . . optional features permit counting to 1 mc. Your RMC Field Engineer has full specs on DY-2401B priced at \$3950.

rmc

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