OCTOBER 1963, Vol. 12, No. 2

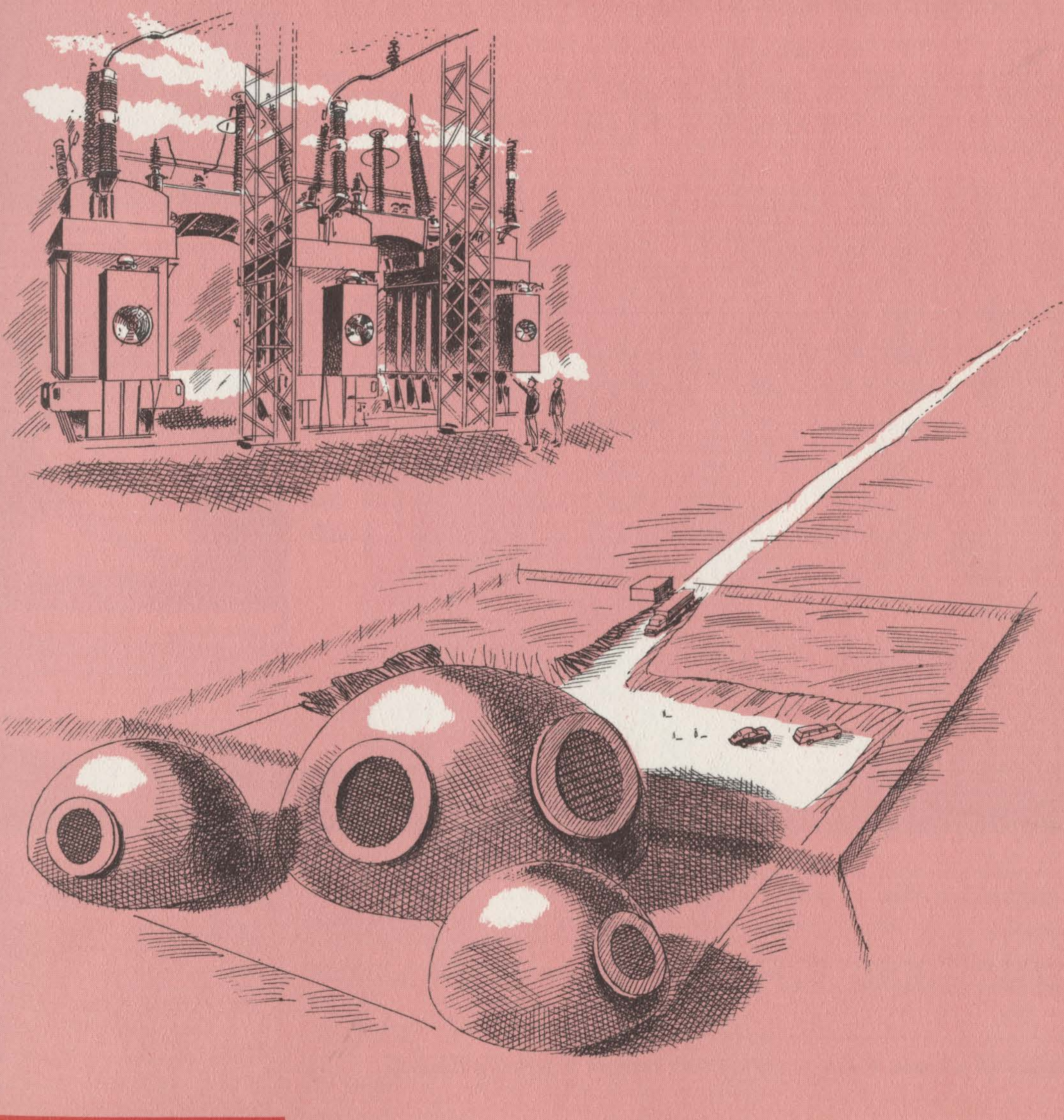
The Reflector

PUBLISHED BY THE BOSTON SECTION OF THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS

FALL LECTURE SERIES

(SEE PAGES 4 & 5)

SUBSTATION DESIGN



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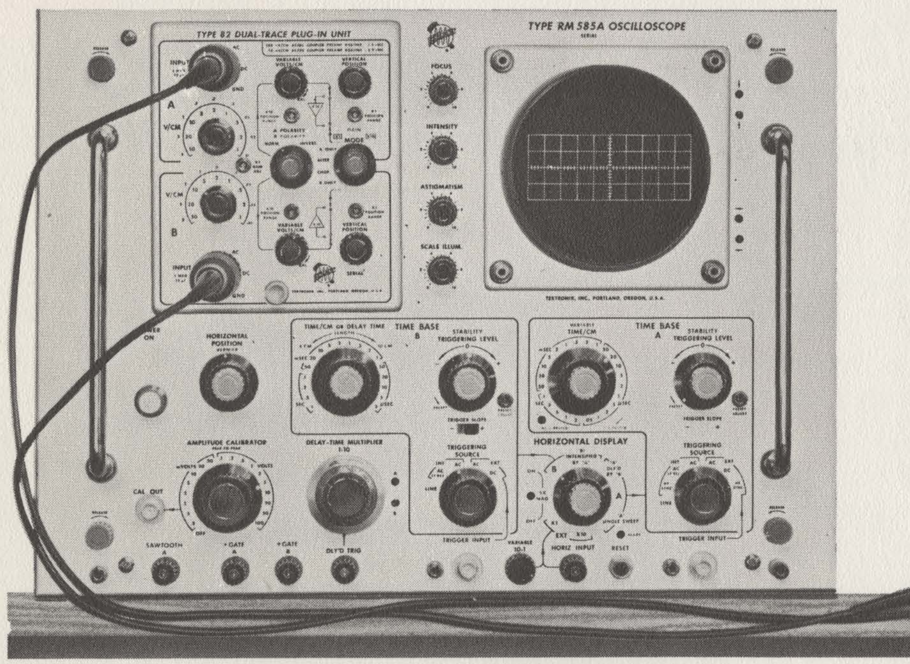

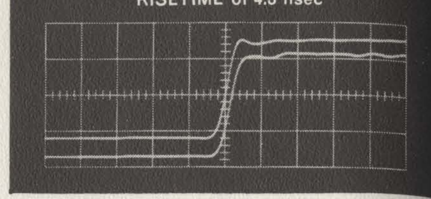

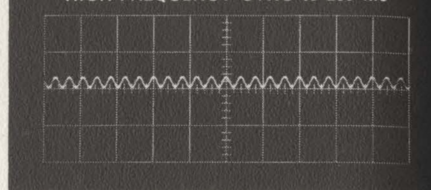

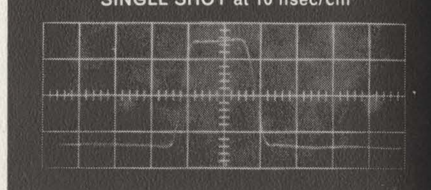

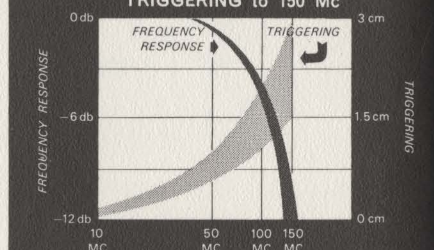

The Reflector

OCTOBER 1963

Volume XII, No. 2

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ADVERTISERS INDEX

THE COVER

An artist's conception of an MAR advanced phased-array radar being developed by Sylvania Electronics Systems, and of modern substation design. Both are topics to be covered in the Fall Lecture Series.

ENGINEERING OBSOLESCENCE

RONALD E. SCOTT
Chairman — Boston Section

It is a widely recognized fact that the "half-life" of an engineer in the technical field is about ten years. Various attempts have been made to stem the tide. A wide variety of up-dating and upgrading courses are offered by engineering schools across the country. MIT has recently announced a centre for the "retooling" of selected engineers.

Most of the differences of opinion regarding engineering manpower requirements can be traced to this problem of technical obsolescence. There is a tremendous demand for recent graduates with advanced degrees trained in the latest technology. There is much less demand for the older engineer who has lived out his technical half-life. Often he is allowed to drift out of engineering entirely.

The basic problem has never been faced. It is economic as well as technical. A typical engineering graduate specializes in a particular technology. Within this sphere he becomes an expert and rises to a position of responsibility. When his area of competence becomes obsolete he is faced with a dilemma. He can learn a new technology and start over again. If he does so, however, he is in direct competition with the recent graduate who is better trained technically and in addition is willing to work for half the salary. Inexorably the older man is forced to take a job which will enable him to maintain his standard of living. He shifts out of the technical field into technical management, general management, promotion, or sales.

Perhaps this pattern is a desirable one. Perhaps an engineer, like a professional athlete, should plan to spend only a few years in a technical specialty. Perhaps we are wasting our time trying to retool engineers. It may be better to provide an adequate supply of recent graduates, and to encourage older engineers to drift into other areas. Yet if we do, we relegate engineering to the mere prelude of a man's serious career. Surely engineering deserves better than this in our modern technological society.

Table of Contents

TWO FALL

LECTURE

SERIES

1. Phased Arrays

2. Electrical Design of Substations
INDOOR & OUTDOOR

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Electrical Design of Indoor and Outdoor Substations

FIVE CONSECUTIVE TUESDAYS
7:00 to 9:00pm

NEW ENGLAND POWER COMPANY HALL
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NOV 19 — OVERALL FACTORS DETERMIN ING DESIGN—space requirements, volt age, outdoor, indoor, load cycle econo mies, transformer choice.

NOV 26 — EQUIPMENT SELECTION AN SPECIFICATIONS—B.I.L. ratings, shor circuit duty, transformer connections neutrals, grounding, bus configuration

DEC 3 — PROTECTION—station shielding, light ing protection, insulation coordination system protection, relaying, line protec tion.

DEC 10 — DISCONNECTING DEVICES—circui breakers, load break switches, power fuse reclosers.

DEC 17 — INSTRUMENT TRANSFORMERS choice of accuracy and specifications, po tential and current devices, burdens, capa bility. Installation and field tests of th completed substations.

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Phased Arrays

FIVE CONSECUTIVE TUESDAYS 8:00 TO 10:00pm
KNIGHT AUDITORIUM — BABSON INSTITUTE — WELLESLEY, MASS.

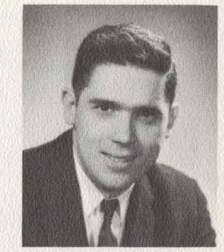
NOV 19


P. W. HOWELLS
General Electric Co.

Array Systems
Paul W. Howells, *General Electric Company*

Fundamental radar requirements for search, track and identification will be reviewed, the compatibility of various array approaches with these requirements will be discussed.

NOV 26


J. L. ALLEN
MIT Lincoln Lab

Large Array Antennas
John L. Allen, *Lincoln Laboratory*

A presentation of the principles of large array antennas will be made. Emphasis will be on providing results and "rules of thumb" useful for systems and components designers, indicating those areas, theoretical and practical, that are not well understood.

DEC 3

Panel Discussion — Power Sources

Moderator	Tetrodes	TWT	FWCT	BUCT
				
G. L. GUERNSEY MIT Lincoln Lab	M. HOOVER RCA	O. T. PURL Watkins Johnson	J. SALOOM SFE	H. SCHARFMAN Raytheon Company

DEC 10


K. MOLZ
Bendix

Phased Array Radar Components
Kenneth F. Molz, *Bendix Radio Division*

Low noise receiver techniques and various approaches to phase shift devices will be presented. Components suitable to the transmitter module and other miscellaneous components, such as fuses and R.F. terminations are to be covered. Problems on signal processing and computer control will also be highlighted.

DEC 17


S. J. RABINOWITZ
ARPA

The Role of the Phased Array in Military Systems
Samuel J. Rabinowitz
Advanced Research Projects Agency

Phased arrays can exhibit great beam steering agility, are capable of forming multiple beams, and are well suited for use in automatic control systems. These unique features of the phased array are reviewed and potential applications discussed.

Please check one

☐ Electrical Design of Indoor and Outdoor Substations

☐ Phased Arrays

NAME ______________________

ADDRESS ______________________

ENCLOSED IS MY CHECK FOR ______________________

Some Recent Advances in Cross-Field Tubes

THE historical background behind recent advances in magnetic oscillators and crossed-field amplifiers is presented. The tube features which have resulted from these advances are discussed, leading to an assessment of the present state of the art of pulsed crossed-field oscillators and amplifiers. Future applications for these classes of tubes are suggested.

J. FEINSTEIN
S-F-D Laboratories

Mr. Feinstein received his B.E.E. in 1944 from Cooper Union Institute of Technology, his M.A. in Physics from Columbia University in 1947, and his Ph.D. in Physics from New York University in 1951. He has been associated with Bell Telephone Labs., Murray Hill, New Jersey, as Sub-Department Head of Microwave Tube Development; National Bureau of Standards, Washington, D. C.; and the Federal Telecommunications Laboratories (I. T. & T.), New York. He is currently associated with S-F-D Laboratories, Union, New Jersey, as Director of Research and Executive Vice President. His work includes research and development of forward-wave crossed-field amplifiers, noise-generator studies, and investigations of quadrupole amplifiers. Work in millimeter waves and in low noise microwave tubes is also being carried out under his direction. Theoretical work is under way on high efficiency lasers.

THURSDAY, OCTOBER 10
Raytheon Spencer Lab
Burlington
Dinner — 7:00pm — Meeting — 8:00pm

Should an Engineer Be President?

MR. Arthur Snyder, who for a number of years has been involved in the birth and growth of many firms in both the engineering and non-engineering world, has selected this interesting and provocative subject for his talk for this season's opening meeting of the Engineering Management group. Our speaker has a keen awareness of what makes for success in the operation of a company in today's business world.

Reflecting the viewpoint held by many bankers and financiers, Mr. Snyder claims that engineers in general do not understand the complexities of the business world and the sophistication of the market place. In his contact with the engineer in the management or executive position, he has characterized him as a "widget-oriented" rather than a profit-oriented individual, obsessed with technical achievement and having little understanding of the market.

In some situations, engineers tend to become the Great White Fathers of paternalistic-type operations, with the attendant danger of harboring and coddling incompetent associates and employees. The strong desire to please others oftentimes exceeds the motive for profit. Increased sales is often improperly used as a measure of growth, when in fact true growth is solely dependent on PROFITS!

Mr. Snyder will elaborate on what he considers the characteristics of success necessary in companies which are to progress; he will examine those traits which tend towards failure. He will include the attributes of the president and treasurer, and how they must complement each other. Mr. Snyder will delve into banking and what the company should look for in a bank, and also the financial world in general.

A. F. F. SNYDER
N.E. Merchants Bank

Mr. Arthur F. F. Snyder graduated from Swarthmore College in 1940. He received his M.B.A. Degree in 1960 from Northeastern University. He served in the U. S. Navy from 1940-45, attaining the rank of Commander. He is Chairman of the Commerce and Industry Division of United Fund, and Chairman of the Military Affairs Committee of The Greater Boston Chamber of Commerce. He is on several boards of directors and is currently Vice President of the New England Merchants National Bank.

TUESDAY, OCTOBER 15
Dinner — 6:00pm — Charterhouse Motel — Exit 48 on 128
Meeting — 8:00pm — Sylvania — 100 First Ave., Waltham

LYNN SUBSECTION

The Search for the Thresher

S. RAYMOND
Benthos Co.

MR. Raymond will discuss new instruments and trends in the science of oceanography and will describe some of the features of the new research vessel, *Atlantis II*. He will highlight his presentation with movies taken aboard the *Atlantis II* during the search for the submarine *Thresher*.

Mr. Raymond is a graduate of MIT and worked for several years in the field of underwater instrumentation. He organized and is President of the Benthos Co., a company concerned with the development and production of specialized instrumentation for oceanographic research.

TUESDAY, OCTOBER 15
Thompson Club, North Reading
Dinner — 6:30pm — Meeting — 8:00pm

Plastic Systems of Sensorimotor Coordination

ALTHOUGH the adaptive powers of the nervous system have long been recognized, their systematic investigation began only recently. Dr. Held's laboratory has pioneered in analyzing the conditions required for adaptation to rearrangements of sensory inputs produced by means of prisms that displace and distort the retinal image and by pseudophones that, in effect, displace the ears around the head. This work has proven the profound importance of muscular action with its accompanying sensory feedback in maintaining the stability of neurological systems responsible for sensorially-guided behavior. The functional blindness of kittens reared with visual stimulation produced solely by passive transport, as compared with the normal vision of their littermates who had been free to locomote through equivalent distances, demonstrates that the same motor-sensory feedback is essential for the development of spatial vision in cats and in other higher mammals. The correlation between neural signals to the musculature and concurrent feedback signals from sensory receptors appears to be the source of information required for the self-organization of these plastic systems.

R. HELD
MIT

Dr. Richard Held is Professor of Experimental Psychology at MIT. He received his B.A. in 1943 and his B.S. in 1944, both from Columbia University, his M.A. in Psychology from Swarthmore College in 1958, and his Ph.D. in Experimental Psychology from Harvard University in 1952. Prior to joining the faculty at MIT, he was at Brandeis University, where he served as Chairman of the Department of Psychology from 1958 to 1962. He has been a Member of the Institute of Advanced Study at Princeton and a Senior Research Fellow of the National Science Foundation.

TUESDAY, OCTOBER 15
Dinner — 6:00pm — MIT Faculty Club
Meeting — 8:00pm — MIT Room 4-231

TECHNICAL GROUP — UTILITY SYSTEMS

Protective Relaying for EHV Systems

J. L. BLACKBURN — *Westinghouse*

THE speaker, Mr. J. L. Blackburn, Section Engineering Manager of the Westinghouse Electric Corporation, Relaying-Instrument Division, is a noted author, lecturer and instructor in the relaying field. In addition, he has several patents on relaying systems filed.

The meeting chairman will be G. A. St. Onge, Stone and Webster Engineering Corporation.

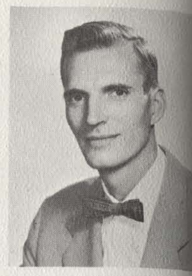
TUESDAY, OCTOBER 15
7:30pm — MIT 10-275

Technical Communication Through Exhibits

THE reasons engineers attend a trade show are many and varied . . . to seek information on new products and materials, hear technical papers, see what the competition is doing, investigate new job opportunities, visit old friends, and so forth. On the other hand, companies participate in trade shows for one primary reason — to promote the sales of their products. The value of a trade show in fulfilling this objective is a debatable subject.

In his opening remarks, Joe Belcher will review some of the pros and cons of trade shows as a technical communications medium, and discuss points to consider in evaluating any particular show. This will be followed by a discussion of the preparation and planning that goes into General Radio Company's exhibits program for a typical year. The program will be concluded by a tour of the Exhibits Department, where GR's exhibit for the forthcoming NEC show will be set up and operating.

Mr. Belcher is well qualified to talk on this subject since he devotes full time to heading up the exhibits program at General Radio. In addition to his several years of experience in exhibits work, he has worked in both the Sales and Service Departments of General Radio during the past twenty years. For two years he served as manager of the company's Los Angeles Sales Engineering Office. His formal education includes completion of courses in both electrical engineering and business management at Northeastern University and Lincoln Institute, from which he graduated in 1943.



J. E. BELCHER
General Radio Co.

WEDNESDAY, OCTOBER 16
Dinner — 6:00pm — Colonial Inn — Concord Center
Meeting — 8:00pm — General Radio Co. — (off Rte. 2) West Concord

Omega

F. C. LEINER
Nortronics Inc.

OMEGA is a new long-range radio aid to navigation. Operating at 10.2 and 13.6 kc/s, the system is expected to provide one-mile accuracy to aircraft, ships, and submerged submarines anywhere on earth.

A hyperbolic phase-measurement system, OMEGA is somewhat similar to LORAN-A and LORAN-C. However, OMEGA's use of very low frequencies provides system characteristics quite different from LORAN. Beyond several hundred miles, VLF sky waves dominate the ground waves and behave as though they were propagated in the space between two concentric reflecting spherical shells representing the earth and the lower edge of the ionosphere. Thus, VLF sky waves propagate around the earth with very useful amplitudes. Also, because of the stability of the ionosphere at VLF, the waves have exceptional amplitude and phase stability, making it possible to make measurements accurate to a few microseconds of phase difference. On the other hand, VLF has two important disadvantages compared to the higher frequencies: (1) atmospheric noise is higher, and (2) it is generally necessary to use high-Q antennas, making it impossible to transmit pulses with short rise times. As a net result, OMEGA is not a true position fixing system like LORAN, but is actually a position tracking system.

When completed, OMEGA will provide world-wide coverage using eight transmitting stations each radiating on the order of 10 kW. The stations will be arranged about the earth in a careful geometric pattern based on a tetrahedron. At any one point on the globe, most of the stations will be receivable, providing a measure of system redundancy.

Extensive system tests have been performed using a triad of three experimental transmitting stations located in Hawaii, Panama, and New York State. Navigation accuracy has been measured throughout the Western Hemisphere using OMEGA receivers aboard ships and aircraft, indicating that an accuracy of better than one mile can be obtained. An important problem is the design of the transmitting antennas, which account for a major share of system cost.

Mr. Leiner is Chief of Communication and Detection Systems at the Marine Equipment Department of the Nortronics Division of the Northrop Corporation. He received his B.S.E.E. at the University of Illinois in 1950 and his M.B.A. from Harvard University in 1956. He has been engaged in the development of VLF navigation systems, VLF time- and frequency-measurement systems, and VHF mobile radio equipment.

THURSDAY, OCTOBER 17
Sylvania — 100 First Avenue — Waltham
8:00pm — Rooms 1A1-1A2

PTG - Reliability

Saturday, Oct. 19th

ANNUAL LADIES' NIGHT and RECOGNITION AWARDS

MARIDOR RESTAURANT
ROUTE 9, FRAMINGHAM

Social Hour:	7:00 to 8:00 pm
Dinner:	8:00 to 9:00 pm
Awards & Citations	9:00 to 10:00 pm
Dancing:	10:00 to Midnight

- **Refreshments**
- **Fun for All**
- **Citations**
- **Awards**
- **Dancing**
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- **Special Ladies' Program**

DON'T MISS THIS VERY SPECIAL EVENING

Specialty of the House: Roast Sirloin of Steer Beef
Special 'technical paper' just for the ladies!
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Street: ....

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My Company: ....

IEEE-PTGR LADIES' NIGHT, SATURDAY, OCTOBER 19
MARIDOR RESTAURANT, ROUTE 9, FRAMINGHAM
Make checks payable to "Boston Section IEEE-PTGR"

Audio Engineering a Symphony Orchestra

THE talk will be illustrated with slides and tape recorded excerpts from the 1963 Berkshire Music Festival. Mr. Kaye will be repeating a talk he is giving for the Audio Engineering Society in New York on October 17, 1963.

Mr. Kaye received his A.B. and M.A. in Physics from Harvard University and received his music training at Harvard and Longy School of Music. He is the former music director of "pioneer" Boston concert station WBMS and is former Chairman of the Boston Society Recorded Music. Mr. Kaye was for three years President of the New England High Fidelity Music Show and pioneered stereo in New England on WCRB (first AM/FM, then FM/MX). He has served on Panel 5, National Stereophonic Radio Committee, has contributed to *High Fidelity* and other technical magazines, and is currently Chairman of the Boston Chapter of the PTG on Audio.

R. L. KAYE
WCRB

MONDAY, OCTOBER 21
Waltham Motor Inn
Winter St. (Exit 48 off 128)
Waltham
Meeting — 8:30pm

High Speed Photography

DR. HAROLD E. EDGERTON

DR. Edgerton has earned international recognition for his achievements in the related fields of stroboscopy and ultra-high-speed photography. His pioneering research in stroboscopic photography was the foundation for the development of the present-day electronic speed flash. Dr. Edgerton originally perfected the use of stroboscopic lights in both ultra-high-speed motion and still photography, capable of revealing operations which move at speeds beyond the perceptive capacity of the human eye.

For his development of aerial electronic photo flash equipment for use in night reconnaissance, Dr. Edgerton received a Certificate of Appreciation from the War Department. In recognition of his achievements in Stroboscopic photography, he has also received the medal of the Royal Photographic Society of London, the Modern Pioneers Award from the National Association of Manufacturers, the Potts Medal from the Franklin Institute, the Medal of Freedom, the Joseph A. Sprague Memorial Award from the National Press Photographers Association, the U. S. Camera Achievement Award Gold Medal, the National Geographic Society's Burr Prize, and the 1959 New England Engineer of the Year Award.

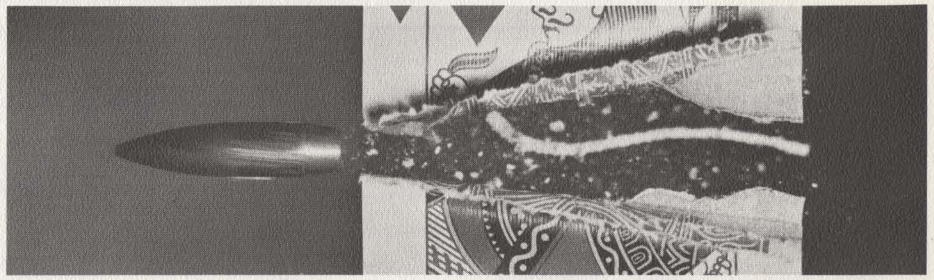
Dr. Edgerton has designed watertight cameras with electronic flash lamps, is a consultant on underwater flash photography and stroboscopy, and has been working with Captain Jacques-Yves Cousteau in explorations of the floor of the Mediterranean Sea. He has also assisted with cameras and lighting equipment for the Bathyscaphes *FNRS III, Trieste* and *Archimede*.

Currently Dr. Edgerton is developing sonar devices for positioning equipment in the sea and for exploration of the subbottom structure.

Dr. Edgerton serves as Chairman of the Board of a consulting and engineering corporation — Edgerton, Germeshausen & Grier, Boston, Mass.

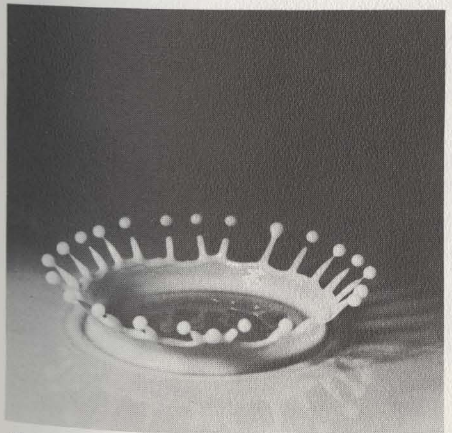
Co-author with Dr. James R. Killian, Jr., of *Flash, Seeing the Unseen with High-Speed Photography,* Dr. Edgerton has also written numerous technical articles.

Dr. Edgerton is a Fellow of the Institute of Electrical and Electronics Engineers, Inc., the Photographic Society of America, and is a member of the American Physical Society, and the Honorary Societies Eta Kappa Nu and Sigma Xi.



A 30 caliber bullet cuts easily across this playing card. This picture was taken at MIT by Dr. Edgerton using an EG&G Microflash. In a darkened room the pre-aimed rifle is fired. Its sound, picked up by a microphone, triggers the ultra-bright, short-duration flashtube in the Microflash. The camera shutter is open during the entire sequence.

MONDAY, OCTOBER 21
Dinner — 6:00pm — Butcher Boy Steak House
Route 125 — North Andover
Meeting — 7:30pm — Merrimack College Auditorium
Routes 114 and 125 — North Andover

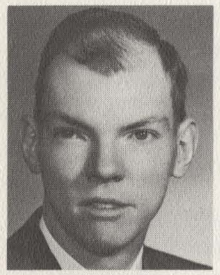


The crown effect has been caused by a drop of milk falling a distance of seven inches into a pan containing a thin layer of milk. The drops themselves trigger the flashtube via a photo-cell and electronic delay system.

JOINT MEETING
PTGs ON INFORMATION THEORY AND COMMUNICATIONS SYSTEMS

Dipoles in Orbit — A Progress Report on the West Ford Experiment

ORBITAL scatter was first seriously proposed as a means of reliable communication by W. E. Morrow, Jr., and H. W. Meyer some five years ago. Now known as Project West Ford, the idea was to place in orbit a narrow cloud or belt of whisker-like wire dipoles or needles, resonant at microwave frequencies, which could scatter back to the earth a portion of a microwave signal passing through it.

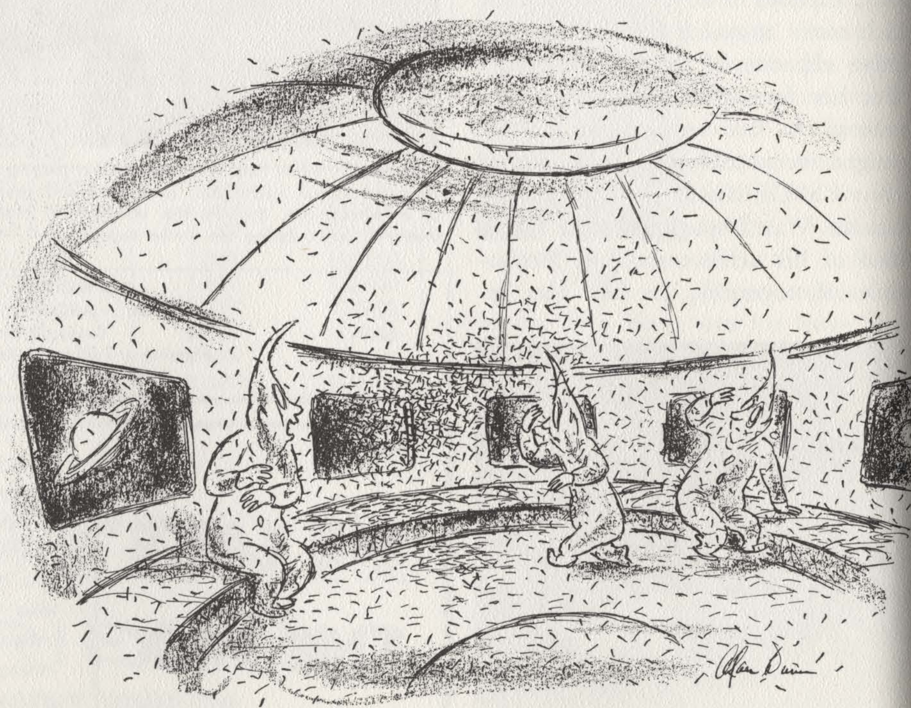


W. E. MORROW Jr.
MIT Lincoln Lab.

Few communication proposals have produced as much spirited discussion in the scientific community as this one. In May 1963 an experimental belt containing approximately 10^8 dipoles (twenty kilograms) was placed in orbit. Since then, its effective scattering cross section has been monitored, orbit perturbations have been checked against theory, and a variety of communication experiments have been carried out. The belt is particularly interesting as an example of a fast-fading partially-coherent medium, so that sophisticated modulation techniques are needed.

Walter E. Morrow, Jr., is Leader of the Space Techniques and Equipment Group at MIT Lincoln Laboratory and has been in charge of Project West Ford. In the past he has been associated with Lincoln Laboratory programs in UHF tropospheric-scatter systems, VHF ionospheric-scatter systems, and transistor circuit design. He is a graduate of MIT.

TUESDAY, OCTOBER 22
Dinner — 6:15pm — Charterhouse — Waltham
Meeting — 8:00pm — Sylvania ARL — 40 Sylvan Rd.



"Close that window!"

• • •

Drawing by Alan Dunn. © 1961, The New Yorker Magazine, Inc.

October IEEE Meetings

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OCTOBER 8 Tuesday, 8:00pm Arthur D. Little, Inc. 15 Acorn Park, Cambridge	General Section Meeting **ENGINEERING IN THE SCIENCE OF LIFE & MAN** Dr. Walter Rosenblith, MIT
OCTOBER 10 Thursday, 8:00pm Raytheon Spencer Lab. Burlington	Electron Devices - See page 6 **SOME RECENT ADVANCES IN CROSSED-FIELD TUBES** Joseph Feinstein, S-F-D Labs. Dinner - Raytheon Spencer Lab. Caf. - 7:00pm
OCTOBER 15 Tuesday, 8:00pm Sylvania Electronic Systems 100 First Ave., Waltham	Engineering Management - See page 7 **SHOULD AN ENGINEER BE PRESIDENT?** Arthur Snyder, N. E. Merchants National Bank Dinner - Charterhouse Motel, Rte. 128, Waltham 6:00pm
OCTOBER 15 Tuesday, 8:00pm MIT, Room 4-231	Biomedical Electronics - See page 8 **PLASTIC SYSTEMS OF SENSORIMOTOR COORDINATION** Richard Held, MIT Dinner - MIT Faculty Club 6:00pm
OCTOBER 15 Tuesday, 7:30pm MIT, Room 10-275	Utility Systems - See page 8 **PROTECTIVE RELAYING FOR E.H.V. SYSTEMS** J. L. Blackburn, Westinghouse
OCTOBER 15 Tuesday, 8:00pm Thompson Club, N. Reading	Lynn Subsection - See page 7 **THE SEARCH FOR THE THRESHER** Sam Raymond, Benthos Company Dinner - Thompson Club - 6:30pm
OCTOBER 16 Wednesday, 8:00pm General Radio Company Baker Ave., (off Rte. 2) West Concord	Engineering Writing & Speech - See page 10 **TECHNICAL COMMUNICATION THROUGH EXHIBITS** Joseph E. Belcher, General Radio Dinner - Colonial Inn, Concord 6:00pm
OCTOBER 17 [illegible]	Aerospace and Navigational [illegible]
OCTOBER 19 *Saturday, 7:00 — Midnight* *Maridor Restaurant, Rte. 9* *Framingham*	Reliability - See page 11 **ANNUAL LADIES NIGHT AND RECOGNITION AWARDS** Advance reservations must be placed with Ray Barnes, Sylvania Electric Products 100 Sylvan Road, Woburn - WElls 3-3500 $4.50 per person
OCTOBER 21 Monday, 8:30pm Waltham Motor Inn Winter St., Waltham Exit 48 off Rte. 128	Audio - See page 12 **AUDIO ENGINEERING A SYMPHONY ORCHESTRA** Richard L. Kaye, WCRB
OCTOBER 21 Monday, 7:30pm Merrimack Coll. Auditorium Tpke. Rd., Rts. 114 and 125 N. Andover, Mass.	Merrimack Valley Subsection - See page 13 **HIGH SPEED PHOTOGRAPHY** Harold E. Edgerton, MIT Dinner - Butcher Boy Steak House Rte 125, N. Andover - 6:00pm
OCTOBER 22 Tuesday, 8:00pm Raytheon Executive Offices Rte. 2 & 128, Lexington	Electronic Computers - See page 18 **LOGICAL ORGANIZATION OF THE CDC 6600 COMPUTER** Ray Allard, Control Data Corp. Dinner - Raytheon Executive Offices - 6:30pm
OCTOBER 22 Tuesday, 8:00pm Sylvania ARL 40 Sylvan Rd. Off Winter St., Waltham	Information Theory & Comm. Systems - See page 14 **DIPOLES IN ORBIT — A PROGRESS REPORT ON THE WEST FORD EXPERIMENT** Walter E. Morrow, Jr., MIT Lincoln Lab. Dinner - Charterhouse Motel, Rte 128, Waltham - 6:15pm
OCTOBER 23 Wednesday, 8:00pm MIT, Room 4-231	Microwave Theory & Techniques, Nuclear Science and Electron Devices - See page 19 **ELECTRON BEAM - PLASMA INTERACTIONS FOR FUSION** Abraham Bers, MIT
OCTOBER 24 Thursday, 8:00pm Raytheon Executive Offices Rte. 2 & 128, Lexington	Military Electronics - See page 20 **SUPER MICROWAVE POWER AND NEW DISCIPLINES** W. C. Brown, Raytheon Company
OCTOBER 29 Tuesday, 8:00pm Raytheon Executive Offices Rte. 2 & 128, Lexington	Instrumentation and Measurements See page 20 **NEW SOLID-STATE DEVICES FOR INSTRUMENTATION APPLICATIONS** M. M. Atalla, - hp associates -

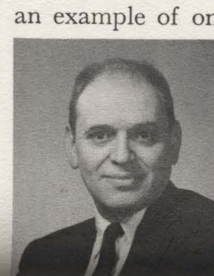
GENERAL SECTION MEETING

Engineering in the Science of Life & Man

DR. WALTER ROSENBLITH

Director of MIT Center Development Office in the Biomedical Sciences

DR. Rosenblith will discuss various applications of science and technology to biology and the life sciences. Computer technology is revolutionizing both the taking of biological data and its reduction to a usable form. Problems in the life sciences are often more complex than problems in the physical sciences and only the very latest tools are powerful enough to make significant inroads upon them. The MIT Lincoln Laboratory LINK computer (Laboratory Instrument Computer) is an example of one of these new tools.



Dr. Walter A. Rosenblith is currently the Director of the MIT Center Development Office for Computer Technology in the Biomedical Sciences. [illegible] functions are to: (1) Conduct research in computer technology and to develop computer systems appropriate to problems in the biological and medical sciences; (2) Conduct research programs in those areas of the biological and medical sciences in which life scientists and computer scientists have overlapping interests, (for the present, studies of the nervous system are at the focus of this effort). In addition, the Center will seek to (3) Provide facilities for faculty affiliates and postdoctoral fellows; (4) Afford opportunities for research by graduate students from participating institutions; (5) Conduct training programs for workers in biomedical and computer research and (6) Carry out advisory functions that fall within the scope of Center activities.

Dr. Rosenblith's various degrees, awards and positions, etc., are too numerous to list here. His major fields *of interest include quantification of electrical activity of the nervous* [illegible] society. Dr. Rosenblith's work has appeared in approximately thirty principal publications throughout his illustrious career.

TUESDAY, OCTOBER 8

Meeting 8:00pm — Arthur D. Little, Inc.

TWO FALL LECTURE SERIES

Consecutive Tuesdays

November 19 — December 17

1. ELECTRICAL DESIGN OF INDOOR AND OUTDOOR SUBSTATIONS

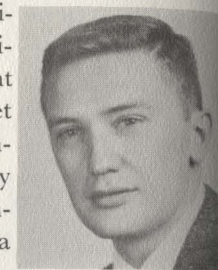
2. PHASED ARRAYS

Register Now

See pages 4 & 5

Logical Organization of the 6600

THE structure of the 6600 is presented in terms of devices capable of concurrent operation on several levels. Communication with peripheral equipment is effected by a set of peripheral computers, which may act as program-controlled data channels or as system-control devices. Characteristics and the instruction set of the peripheral computers are outlined.



R. W. ALLARD
Control Data Corp.

The system central computer is purely a high speed computer, leaving all input-output functions to the peripheral system. Data registers, instruction registers, independent functional units, and their interactions are discussed in detail.

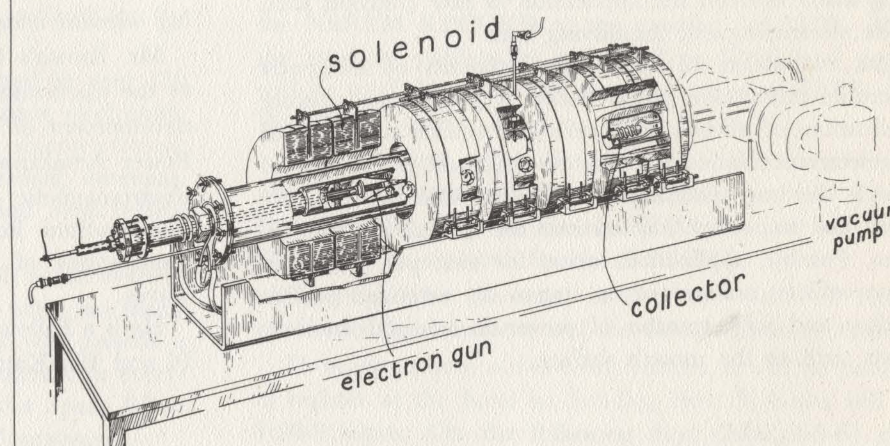
Coding and automatic compilation are examined to determine what efficiencies are produced by machine organization and how programming can affect concurrent operation.

Differences and similarities between the 6600 and other giant computers are discussed. The physical features that make the speed and organization of the 6600 possible are summarized with some attention to the subject of current limitations on computer performance.

TUESDAY, OCTOBER 22
Raytheon Executive Offices
Junction of Rtes. 2 & 128, Lexington
Dinner — 6:15pm
Meeting — 8:00pm

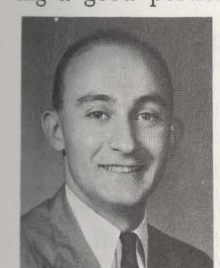
Electron Beam — Plasma Interaction for Fusion*

CONTROLLED thermonuclear fusion is considered to be the main source of energy in the sun and many stars. Its realization on earth would provide an essentially inexhaustible source of energy for mankind. One of the critical prerequisites for fusion is that the ions in a confined, high-density plasma be very "hot" (2×10^5 °K). Hence, plasmas that are produced on earth require "heating." That is, large amounts of energy must be imparted to the ions.



M.I.T BEAM-PLASMA DISCHARGE APPARATUS

An electron beam can provide a simple and very powerful energy-density source. For example, a hollow beam, used in the generation of multi-megawatts of microwave power, has an energy density of 10^8 watts/cm^2. On the other hand, a plasma near its characteristic frequencies exhibits fields that are ideally suited for interaction with an electron beam. Hence, an electron beam injected into a plasma should be capable of delivering a good portion of its d.c. energy to the plasma particles. In the simplest fashion, this energy conversion can be thought of in analogy with the known interactions between electron beams and circuits that are commonly used in the generation of microwave power



A. BERS
MIT

When an electron beam is injected into a cold plasma the prominent interactions occur at frequencies characteristic of the electrons in the plasma. In a cold plasma the electrons, because of their lighter mass, short out the fields that would interact with the ions. Once the electrons are warmed up, either by a beam or by any other means, an electron beam injected into such a plasma can be made to interact at frequencies characteristic of the ions in the plasma, and hence heat the ions.

Dr. Bers received the B.S. degree with highest honors in electrical engineering from the University of California, Berkeley, in 1953, and the S.M. and Sc.D. degrees from the Massachusetts Institute of Technology, Cambridge, in 1955 and 1959, respectively.

During his graduate studies at MIT he was associated with the Department of Electrical Engineering and the Research Laboratory of Electronics as a Research Assistant and as an Instructor. During that time he was concerned with problems of noise on electron beams, network theory, and the theory of multi-cavity klystrons. In June of 1959 he received the Television Shares Management Corporation Award for excellence in teaching. At present he is Associate Professor of Electrical Communications in the Department of Electrical Engineering at MIT, and his major interests are in plasmas, beam-plasma interactions, and the electrodynamics of dispersive media. He is coauthor of the book *Waves in Anisotropic Plasmas* published by the MIT Press.

* This work was supported in part by the U. S. Army, the Air Force Office of Scientific Research, and the Office of Naval Research; and in part by the National Science Foundation (Grant G-24073).

WEDNESDAY, OCTOBER 23
8:00pm — MIT Room 4-231

Super Microwave Power and New Disciplines

WITHIN the past year, 400 kilowatts of continuous power at a frequency of 3000 Mc/s has been generated in a single compact Amplitron device with an accompanying efficiency of over 70%. This power level represents a twenty-fold increase in the state of the art within a three-year period and indicates the rate of progress being made through the application of new concepts such as the electromagnetic amplifying lens.

The availability of such large amounts of efficiently generated microwave power makes it possible to consider applications of microwaves previously outside the scope of the electronics industry. One of the most interesting of these is the transportation of energy by microwave beam, which has important implications for specialized applications. Possible applications arise, for example, with airborne vehicles maintained on station for extended periods of time and with transfer of power in unusual environments such as the moon's surface.

Mr. W. C. Brown is Manager, Super Power Programs, Microwave and Power Tube Division of Raytheon Company. In this capacity he directs development activities in the area of super microwave power generation, and the investigation of the various application areas including wireless transmission.

W. C. BROWN
Raytheon Company

Mr. Brown's technical contributions to the electronics industry include the development of the Amplitron, Super Power Amplitron, the concept of the electromagnetic amplifying lens, and investigations into the principles and applications of power transmission by electromagnetic waves.

He is a Fellow of the IEEE and a member of Tau Beta Pi and Eta Kappa Nu.

THURSDAY, OCTOBER 24
Raytheon Company Executive Offices
Junction of Routes 2 and 128, Lexington
Meeting — 8:00pm

New Solid State Devices for Instrumentation Applications

M. M. ATALLA — *Hewlett Packard*

THE role of three new families of devices in the field of instrumentation and measurements will be discussed. These are (1) hot carrier diodes and hot carrier triodes, (2) injection luminescence light coupled amplifiers and choppers, and (3) step-recovery diodes. In each case we will discuss the underlying physics, the present state of the art, the potentialities and limitations, and their possible applications in the fields of instrumentation and measurements.

Dr. M. M. Atalla is currently Director of Research & Development of -hp associates- in Palo Alto, California. He received the B.S. degree from Cairo University in 1945, the M.S. and Ph.D. from Purdue University in 1947 and 1949. He was a member of the technical staff at Bell Telephone Laboratories in Murray Hill, New Jersey, from 1950-1961.

Dr. Atalla is the author of many technical papers in the field of semiconductor physics and technology and holds several patents on devices and device technology. He is a member of the American Physical Society, Sigma Pi Sigma, and Sigma Xi.

TUESDAY, OCTOBER 29
Raytheon Company Executive Offices
Junction of Routes 2 and 128, Lexington
Meeting — 8:00pm

Significant R & D Progress in NEREM-63 Program

A HIGHLY diversified technical program, featuring over 100 papers in twenty-two acutely active fields, has been scheduled for NEREM-63, the 17th Northeast Electronics Research and Engineering Meeting, that will be held in Boston, Nov. 4-5-6.

Paying tribute to the scope of the conference in a proclamation declaring November 4-11 as *Electronics Week in Massachusetts*, Gov. Endicott Peabody cited its impact on industry and the sciences. Once again, he pointed out, engineers, scientists, technical personnel and members of industry will gather to re-evaluate and survey the advancements achieved during the year and the outlook for the future.

The variety of subject areas, to be covered by over 130 specialists, include such timely topics as space electronics, energy conversion, biomedical electronics, microelectronic technology, microwave measurements, plasmas, antennas, transistor circuitry, quantum electronics and even hydrospace communications.

One of the highlights of the meeting will be an evening session on large-scale project management, when key members of government agencies and industry will present a critical appraisal of four areas of major concern to everyone: *The Polaris Weapon System . . . NASA Space Effort . . . ComSat* . . . and *Weapon System Management.*

The annual Banquet, on Wednesday evening, Nov. 5, also reflects the imposing stature of the program. In a talk on the information revolution, G. L. Haller, Vice President, General Electric, will assess the broad developments that have emerged from the early days of the industrial revolution to the present, where we are now faced with a spiralling information revolution, surely destined to create striking changes in our way of life.

NEREM will also be highlighted by a huge exhibition in the Commonwealth Armory, where several million dollars worth of the latest in electronic equipment will be displayed in over 400 booths by more than 300 exhibitors.

And, as in the past, all IEEE registrants will receive, at no additional fee, a copy of a letterpress-printed NEREM RECORD, a conference report covering all of the papers. The fifth volume in a continuing series, with over 200 pages and more than 500 illustrations, this edition will include cross-reference, subject-author indexing.

Non-IEEE registrants will be able to obtain copies of the NEREM RECORD at the meeting for $2.00. After the meeting, publication price will be $7.50, and copies will be available from the Boston Section of IEEE, 313 Washington Street, Newton, Mass. 02158.

The technical registration fee for IEEE members — which includes the NEREM RECORD — will be $2.00; for others the fee will also be $2.00, but an additional $2.00 will be charged for the RECORD.

Papers will be presented in both the Somerset Hotel, conference headquarters, and the Commonwealth Armory.

To accommodate out-of-town visitors, it will be possible to register at the hotel on Sunday, Nov. 3; hours will be 3:00-9:00pm. On the following days (Nov. 4-5-6) registration hours will be 9:00am to 10:00pm, except Wednesday, the last day, when registration will close at 6:00pm.

Commonwealth Armory registration will begin on Monday, Nov. 4, at 1:00pm and continue until 10:00pm. On Tuesday, Nov. 5, the registration desks will be open from 9:30am to 10:00pm, and on Wednesday, Nov. 6, the hours will be 9:30am to 6:00pm.

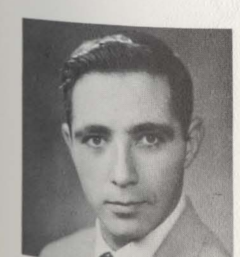
Program Chairman

A. O. McCOUBREY
BOMAC

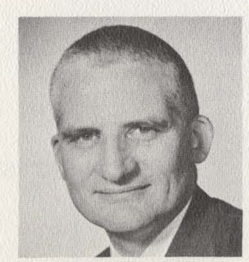
Program Vice Chairman

J. E. STORER
Sylvania

Session Organizers (not Chairmen)

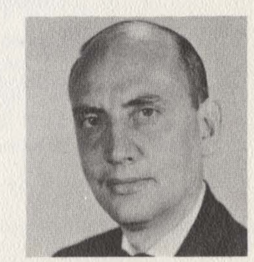


P. RIZZI
Microwave Technology



R. HILLS
Itek Corp.

G. ST. JOHN
Microwave Assoc.



G. WADE
Raytheon Company

The Commonwealth of Massachusetts

By His Excellency

ENDICOTT PEABODY

Governor

A PROCLAMATION

WHEREAS, The past two decades have produced a vast change in our Commonwealth and nation through the extensive use of electronics, and

WHEREAS, Massachusetts, with its many institutes of higher learning and facilities for the electronics industry, has been a leader in establishing the industry as an integral part of this nations economic and scientific growth, and

WHEREAS, From the simplest tasks of daily living to the complex problems of defending our nation, the electronics industry plays an indispensable role, providing mankind with the tools for happier, more secure living conditions, and

WHEREAS, The 17th Northeast Electronics Research and Engineering Meeting is once again being held to re-evaluate and reconsider the advancements made in the past year;

NOW, therefore, I, ENDICOTT PEABODY, Governor of the Commonwealth of Massachusetts, do hereby proclaim as

ELECTRONICS WEEK IN MASSACHUSETTS

November 4 through November 11, 1963

and urge all the citizens of the Commonwealth to join with me in paying tribute to the electronic scientists, engineers, technical personnel and members of the industry who have done so much to provide our citizens with the conveniences of the day and to keep the United States a leader in industrial and military strength.

GIVEN at the Executive Chamber in Boston, this fourth day of April, in the year of our Lord, one thousand nine hundred and sixty-three, and of the Independence of the United States of America, the one hundred and eighty-seventh.

By His Excellency the Governor

ENDICOTT PEABODY

KEVIN H. WHITE
Secretary of the Commonwealth

GOD SAVE THE COMMONWEALTH OF MASSACHUSETTS

Advance Program

1963

NORTHEAST

ELECTRONICS RESEARCH

and

ENGINEERING MEETING

(NEREM 63)

COMMONWEALTH ARMORY

and

SOMERSET HOTEL

BOSTON, MASS.

NOVEMBER 4, 5, 6, 1963

MONDAY — NOVEMBER 4, 1963

Afternoon — Armory

1. MICROWAVE MEASUREMENTS AND TECHNIQUES

Chairman: W. Peyser
Sanders Associates, Nashua, N. H.

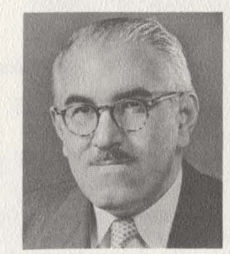
Microwave and Optical Interference Filters—Some Similarities and Differences
L. Young
Electromagnetic Technical Laboratory, Stanford Research Institute, Menlo Park, Calif.
P. W. Baumeister
Institute of Optics, University of Rochester, Rochester, N. Y.

Phase Measurement Techniques for Advanced Microwave Systems
W. E. Jarvis and P. Lacy
Wiltron Co., Palo Alto, Calif.

Measurement of Short Term Phase and Gain Stabilities of Two Parametric Amplifiers
F. O'Hara and R. Vervoort
Raytheon Co., Bedford, Mass.

Indium Antimonide Varactors
C. M. Allen, P. R. Liegley and B. Salzberg
Airborne Instruments Laboratory, Melville, L. I., N. Y.

Polarization Techniques and Components for Radar and Communication Systems
P. J. Allen and R. D. Tompkins
Radar Div., U. S. Naval Research Laboratory, Washington, D. C.



2. INSTRUMENTATION

Chairman: A. Miller
Sanborn Co., Waltham, Mass.

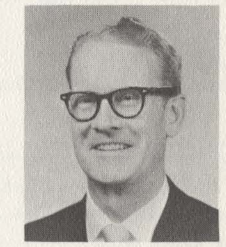
A 12-Mcls Nine-Bit Digital Function Generator
E. F. Kovanic
Bell Telephone Laboratories, Inc., Murray Hill, N. J.

Pulse Evaluation of the Frequency Dependency of Dielectric Parameters
L. Hedrick
Tektronix, Inc., Beaverton, Ore.

Microwave Swept-Frequency Measurements Using a Feedback-Leveled Signal Source
P. C. Ely and R. L. Dudley
Hewlett-Packard Co., Palo Alto, Calif.

Design of a Wide Dynamic Range Camera Exposure Controller
P. T. Gates, Jr.
Edgerton, Germeshausen and Grier, Inc., Boston, Mass.

Outstanding Problems in Earth Science Instrumentation
D. P. Keily
Dept. of Meteorology, MIT, Cambridge, Mass.



Afternoon — Somerset Hotel

3. SPACE ELECTRONICS

Chairman: F. Niemann
NASA, Boston, Mass.

Satellite Ground Data Networks
J. T. Mengel
Goddard Space Flight Center, NASA, Greenbelt, Md.

NASA Guidance and Control
Col. C. H. Gould, USMC
OART, NASA, Washington, D. C.

Physics of the Interplanetary Medium
C. W. Snyder
Jet Propulsion Laboratory, California Inst. of Technology, Pasadena, Calif.

4. PLASMAS

Chairman: M. Allen
Microwave Associates, Burlington, Mass.

Magnetohydrodynamic Power Generation
H. Woodson
Dept. of E. E., MIT, Cambridge, Mass.

Recent Developments in Controlled Fusion
A. S. Bishop
Plasma Physics Laboratory, Princeton University, Princeton, N. J.

Waves in Solid State Plasmas
S. J. Buchsbaum
Bell Telephone Laboratories, Inc., Murray Hill, N. J.

Plasma Measurements in Reentry Physics
E. Rolfe
Raytheon Co., Waltham, Mass.

Plasma Diagnostics with Short Electromagnetic Pulses
H. J. Schmitt
Sperry Rand Research Center, Sudbury, Mass.

Afternoon Somerset Hotel

5. LARGE SCALE PROJECT MANAGEMENT

Chairman: K. C. Black
Scientific Analysis Corp., Concord, Mass.

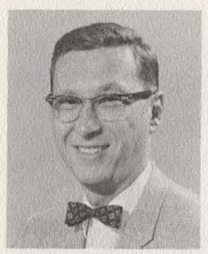
The Polaris Weapon System
Rear Adm. I. J. Galantin
Special Projects Office Dept. of The Navy, Washington, D. C.

The NASA Space Effort
J. F. Shea
Office of Manned Space Flight, NASA, Washington, D. C.

Managing Weapon System Programs
Maj. Gen. C. H. Terhune, Jr.
Electronic Systems Div., USAF, L. G. Hanscom Field, Bedford, Mass.

A Single Global Communications Satellite System
J. V. Charyk
Communications Satellite Corp., Washington, D. C.

TUESDAY — NOVEMBER 5, 1963



Morning Armory

6. ANTENNAS

Chairman: L. Stark
Hughes Aircraft Co., Fullerton, Calif.

Phase Patterns and Phase Centers
J. Ruze
MIT Lincoln Laboratory, Lexington, Mass.

Combination Diplexer and Circular Polarization Transducer
J. B. Rankin
MIT Lincoln Laboratory, Lexington, Mass.

A Circular Polarizer for Linear Polarized Antennas
G. Ploussios
Chu Associates, Littleton, Mass.

A Waveguide Huygens Radiator
J. W. Duncan
Hughes Aircraft Co., Fullerton, Calif.

A Multiple Beam Forming Network Using a Multimode Radial Transmission Line
J. S. Ajioka
Hughes Aircraft Co., Fullerton, Calif.

7. TRANSISTOR CIRCUIT DESIGN — STATUS REPORT

Chairman: F. H. Blecher
Bell Telephone Laboratories, Inc., N. Andover, Mass.

Solid-State DC Amplifiers
D. F. Hilbiber
Fairchild Semiconductor Div., Fairchild Camera and Instr. Corp., Palo Alto, Calif.

Transistor Feedback Amplifiers
F. D. Waldhauer
Bell Telephone Laboratories, Inc., Murray Hill, N. J.

Wideband Transistor IF Amplifiers and AGC Circuits
F. J. Witt
Bell Telephone Laboratories, Inc., Murray Hill, N. J.

High-Speed Transistor-Switching Circuits
W. Peil and L. J. Ragonese
Electronics Laboratory, General Electric Co., Syracuse, N. Y.

Transistor Blocking Oscillators as Nanosecond Pulse Generators
J. C. McDonald
Sylvania Electric Products Inc., Mountain View, Calif.

Morning Somerset Hotel

8. QUANTUM ELECTRONICS

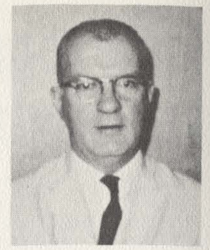
Chairman: R. W. Damon
Sperry Rand Research Corp., Sudbury, Mass.

Injection Lasers and Injection Luminescence
R. H. Rediker
MIT Lincoln Laboratory, Lexington, Mass.

Gain of Ruby Lasers in Large Inhomogenous Magnetic Fields
E. G. Brock, F. C. Unterleitner and Y. C. Kiang
Quantum Physics Laboratory, General Dynamics / Electronics, Rochester, N. Y.

Rare Earth Chelates as Laser Materials
A. Lempicki, A. Samuelson and C. Brecher
General Telephone and Electronics Laboratories, Inc., Bayside, N. Y.

Nonlinear Optical Phenomena
R. W. Minck
Scientific Laboratory, Ford Motor Co., Dearborn, Mich.



9. AUTOMATIC CONTROL

Chairman: G. W. Ogar
Boston Res. — Dev. Lab., AC Spark Plug Div., G.M. Corp., Wakefield, Mass.

Optimal Control Theory Applied to a Probabilistic Intercept Problem
F. B. Tuteur and J. S. Tyler
Dept. of Eng. and Applied Science, Yale University, New Haven, Conn.

Analysis of a Sampled-Data Relay Servo with Hysteresis
J. C. Goclowski
Boston Res. - Dev. Lab., AC Spark Plug Div., G.M. Corp., Wakefield, Mass.

Nyquist and Bode Plots Using An Analog Computer
C. W. Richard, Jr.
Air Force Institute of Technology, Wright-Patterson AFB, Ohio

A Means for Optimum Signal Identification
A. Gelb, A. Dushman and H. J. Sandberg
Dynamics Research Corp., Stoneham, Mass.

Steepest Descent Solution of Suboptimal Stochastic Control Problems
D. E. Johansen
Sylvania Electric Products Inc., Waltham, Mass.

Afternoon Somerset Hotel

10. PHOTOVOLTAIC AND ELECTROCHEMICAL ENERGY CONVERSION

Chairman: A. J. Rosenberg
Tyco Laboratories, Inc., Waltham, Mass.

Photovoltaic Solar Energy Conversion
J. J. Loferski
Div. of Eng., Brown University, Providence, R. I.

Theory of Electrochemical Energy Converters
A. C. Makrides
Tyco Laboratories, Inc., Waltham, Mass.

Fuel Cells
D. L. Douglas
General Electric Co., Lynn, Mass.

Recent Developments in Primary and Secondary Electrochemical Batteries
T. J. Hennigan
Goddard Space Flight Center, NASA, Greenbelt, Md.

Afternoon Armory

11. ANTENNA FEED SYSTEMS

L. J. Ricardi
MIT Lincoln Laboratory, Lexington, Mass.

Beamshaping by Use of Higher Order Modes in Conical Horns
P. D. Potter and A. C. Ludwig
Jet Propulsion Laboratory, California Inst. of Technology, Pasadena, Calif.

A Low-Noise Multimode Cassegrain Monopulse Feed with Polarization Diversity
P. A. Jensen
Hughes Aircraft Co., Fullerton, Calif.

Control and Optimization of a Multimode Square Feed for Sum and Difference Patterns
V. V. Galindo and C. Y. Pon
Dalmo Victor Co., Belmont, Calif.

A High Performance Microwave Antenna for High Density Relay Systems
R. F. H. Yang and A. G. Holtum, Jr.
Andrew Corp., Chicago, Ill.

A New Multimode Monopulse Feed
P. Foldes and S. Komlos
RCA Victor Co., Ltd., Montreal, Canada

12. MICROWAVE AND SOLID STATE

Chairman: M. Hines
Microwave Associates, Inc., Burlington, Mass.

Fundamental Properties of Broadband Nonlinear-Reactance and Tunnel-Diode Amplifiers
W. H. Ku and P. R. Johannessen
Sylvania Electric Products Inc., Waltham, Mass.

Extremely Low Noise Parametric Amplifiers
M. Uenohara
Bell Telephone Laboratories, Inc., Murray Hill, N. J.

Semiconductor Microwave Phase Control
J. F. White
Microwave Associates, Inc., Burlington, Mass.

Recent Research with the Hydrogen Maser
D. Kleppner
Physics Laboratories, Harvard University, Cambridge, Mass.

Mixing and Detection of Laser Light in a Bulk Photoconductor
P. D. Coleman
Ultramicrowave Laboratory, University of Illinois, Urbana, Ill.

Afternoon Somerset Hotel

13. SUBMARINE CABLE COMMUNICATION SYSTEMS

Chairman: C. H. Elmendorf
Bell Telephone Laboratories, Inc., N. Andover, Mass.

Submarine Cable System Design
C. H. Elmendorf
Bell Telephone Laboratories, Inc., N. Andover, Mass.

Submarine Cable Laying
R. D. Ehrbar
Bell Telephone Laboratories, Inc., Murray Hill, N. J.

Oceanography and the Submarine Cable
B. C. Heezen
Lamont Geological Observatory, Columbia University, Palisades, N. Y.

A Problem of Oceanographic Instrumentation
P. F. Smith
Geodyne Corp., Waltham, Mass.

14. THERMAL ENERGY CONVERSION

Chairman: J. H. Huth
The RAND Corp., Washington, D. C.

Thermionic Conversion: Science and Engineering
N. S. Rasor
Thermo Electron Engineering Corp., Waltham, Mass.

Thermoelectric Converters
A. I. Mlavsky
Tyco Laboratories, Inc., Waltham, Mass.

Nernst-Ettingshausen Energy Conversion
T. C. Harman
MIT Lincoln Laboratory, Lexington, Mass.

MHD Energy Conversion
R. J. Rosa
Avco-Everett Research Laboratory, Avco Corp., Everett, Mass.

EVENING — Somerset Hotel

Annual Banquet

Guest Speaker: G. L. Haller, Vice President, Defense Electronics Div., General Electric Co., Syracuse, N. Y.

The Information Revolution
A searching assessment of the sweeping advancements that have emerged from the early days of the industrial revolution to the new dynamic information revolution destined to create startling changes in our way of life.

Morning Armory

15. BIOMEDICAL ELECTRONICS

Chairman: A. T. Kornfield
The Biosearch Co., Boston, Mass.

Physical Techniques for Searching the Universe for Life
W. Sinton
Lowell Observatory, Flagstaff, Ariz.

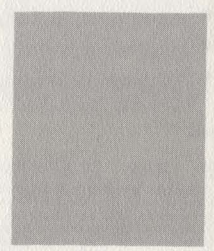
Bioelectric Power Sources
Q. Van Winkle
Dept. of Chemistry, Ohio State University, Columbus, Ohio

Progress in Integrated Instrument Display Development
L. Guarino
Aero Instrument Laboratory, U. S. Naval Air Development Ctr., Johnsville, Pa.

Aspects of Sensory Coding in the Nervous System
G. L. Gerstein
Center Devel. Office for Computer Technology in the Biomedical Sciences, MIT, Cambridge, Mass.

Major Problems and Concepts in Biomedical Electronics
A. T. Kornfield
The Biosearch Co., Boston, Mass.

A Study of Human Postural Control
J. C. Houck, Jr.
Cambridge, Mass.



16. MICROELECTRONICS TECHNOLOGY

Chairman: R. H. Baker
MIT Lincoln Laboratory, Lexington, Mass.

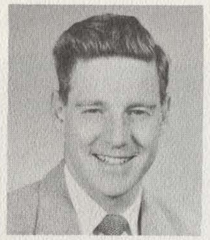
A Review of the Status of Microcircuits Applications in Military Systems
R. Alberts
Electronic Technology Laboratory, Wright-Patterson AFB, Ohio

A Philosophy and Technology for Silicon Monolithic Integrated Circuits
T. A. Longo
Sylvania Electric Products Inc., Woburn, Mass.

The Pellet Approach to Microelectronics
S. M. Stuhlbarg
P. R. Mallory and Co., Inc., Indianapolis, Ind.

Performance Figures of Merit for Integrated Circuits
H. Gunther Rudenberg
Arthur D. Little, Inc., Cambridge, Mass.

Design and Packaging of Miniaturized Digital Equipment
F. Plemenos and W. McMorran
Raytheon Co., Sudbury, Mass.



17. QUANTUM ELECTRONICS — MODULATION

Chairman: R. Kingston
MIT Lincoln Laboratory, Lexington, Mass.

Microwave Frequency Photodiodes
D. E. Sawyer
Sperry Rand Research Center, Sudbury, Mass.

Strain Effects in Electroptic Light Modulators
I. P. Kaminow
Crawford Hill Laboratory, Bell Telephone Laboratories, Inc., Holmdel, N. J.

Further Developments in Wideband Coherent Light Modulators
C. J. Peters
Sylvania Electric Products Inc., Waltham, Mass.

Noise Reduction in Laser Amplifiers
H. Kogelnick and A. Yariv
Bell Telephone Laboratories, Inc., Murray Hill, N. J.

18. ADVANCED RADAR TECHNOLOGY

Chairman: S. H. Weiss
MIT Lincoln Laboratory, Lexington, Mass.

Long-Range Millimeter Radars
V. L. Lynn
MIT Lincoln Laboratory, Lexington, Mass.

Use of Burst Mode Waveforms in High Resolution Radars
A. A. Galvin
MIT Lincoln Laboratory, Lexington, Mass.

Phased Array Design Considerations
B. K. Nelson
Sylvania Electric Products Inc., Waltham, Mass.

Resolution Improved Filtering
H. L. Groginsky and N. Freedman
Raytheon Co., Wayland, Mass.

Tube Applications in High Power Radars
J. D. McCarthy
Raytheon Co., Bedford, Mass.

19. INFORMATION TECHNOLOGY

Chairman: D. B. Brick
Sylvania Electric Products Inc., Waltham, Mass.

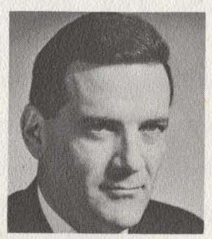
Design Methodologies for Large Command and Control Systems
Col. A. Debons
Electronic Systems Div., AF Systems Command, L. G. Hanscom Field, Bedford, Mass.

Automatic Processing of Pictorial Information
A. Rosenfeld
The Budd Co., Inc., L. I. City, N. Y.

Smoothing and Differential Operators for Digital Processing of Sampled-Field Data
D. P. Petersen
Weather System Center, United Aircraft Corp., Farmington, Conn.

Some Data Processing Capabilities of Neuron Models
E. E. Nelson, S. S. Viglione and H. F. Wolf
Astropower Inc., Newport Beach, Calif.

Computer-Aided Methods for Monitoring the Performance of a Class of Adaptive Pattern Attribute-Organizing Procedures
C. M. Walter
Data Sciences Laboratory, AFCRL, L. G. Hanscom Field, Bedford, Mass.



Afternoon — Armory

20. MICROELECTRONICS APPLICATIONS

Chairman: W. C. Dunlap
Raytheon Co., Waltham, Mass.

Integrated Circuits Compatible with an RF Amplifier
R. L. Hartley
Motorola Semiconductor Products, Inc., Phoenix, Ariz.

The Relationship of Device Design and Characterization to the Performance of Monolithic Integrated Circuits
E. A. Blanchette and J. A. Narud
Motorola Semiconductor Products, Inc., Phoenix, Ariz.

A Planar Diffused General Purpose Monolith
J. R. Cricchi, W. N. Jones and W. F. List
Westinghouse Electric Corp., Baltimore, Md.

A Pattern Recognition System Using Integrated Circuits
T. V. Sikina and S. A. Idzik
Philco Corp., Lansdale, Pa.

Unique Lightweight Tone Recognition Circ...
J. Hohmann and A. Bramble
Semiconductor and Microelectr... Branch, USAELROL, Fort Mon... mouth, N. J.

Vaccum-Deposited Silicon Thin-Film Diodes and Transistors
E. Rasmanis and J. E. Cline
Sylvania Electric Products Inc., Wal... tham, Mass.

21. COHERENT PROPAGATION

Chairman: S. MacNeille
American Optical Co., Waltham, Ma...

Optical Experiments with a Visible Gas Laser
R. E. Hopkins
Institute of Optics, University of Ro... chester, Rochester, N. Y.

Photoelectric Detection of Light Fluctuations
E. Wolf
Dept. of Physics and Astronomy, Uni... versity of Rochester, Rochester, N. Y.

The Ring Laser Rotation Rate Sensor
D. T. M. Davis, Jr.
Sperry Gyroscope Co., Great Neck, N. Y.

Afternoon — Somerset Hotel

22. RADIO ASTRONOMY

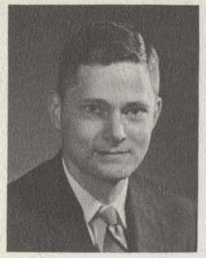
Chairman: S. Goldstein
Harvard Observatory, Harvard, Mass.

A Multiplate Radioastronomy Antenna
A. C. Schell
AF Cambridge Research Laboratories, Bedford, Mass.

A C-Band Switched Maser Radiometer
J. A. DeGruyl, S. Okwit and J. G. Smith
Airborne Instruments Laboratory, Deer Park, L. I., N. Y.
H. Hvatum
National Radio Astronomy Observatory, Green Bank, W. Va.

Search for Line Emission from Interstellar OH Radicals
A. A. Penzias
Crawford Hill Laboratories, Bell Telephone Laboratories, Inc., Holmdel, N. J.

Microwave Radiometry — Data from Venus
A. E. Lilly
Harvard University, Cambridge, Mass.



Editor
BRUCE B. BARROW

Parochialism in the IEEE

THE first article of the IEEE Constitution states that

> The character of [the Institute's] scope is non-national, and the territory in which its operations are to be conducted is the entire world.

Here is a declaration of assurance to IEEE members that they may expect Institute interest in and support of their professional activities wherever they may live. It is at the same time a friendly admonition to other professional societies that the Institute will not accede to a division of the world into exclusive spheres of influence. The adjective *non-national* was carefully chosen. It emphasizes the non-political nature of the organization, whereas the word *international* would have implied a responsibility to bring together different national groups.

So much for the principle—what about practice? Last month one of the PTGs sponsored a 7th National Convention on Military Electronics; this month another will hold a 9th National Communications Symposium. In August both *Proc. IEEE* and *Electrical Engineering*, which are usually carefully edited to remove *faux pas* of this sort, announced that new policies had been adopted concerning the "national Awards" of the IEEE. Of course no slights were intended—Canadian members will be welcomed in Utica if they attend the Communications Symposium, and the Geneva Section must continue to propose its qualified members for IEEE awards—but someone once observed that it is the mark of a gentleman never to insult someone unintentionally.

The difficulty is not simply that the word *national* is being used inappropriately. Such a simple difficulty would properly remain the exclusive province of editors. The problem is that the rank and file of IEEE members in America consistently refer to the Institute in national terms and thereby betray a lack of awareness, a cast of mind, that can only be described as parochial.

Parochialism of this sort, if it remains a characteristic part of the thinking of the preponderant American majority of IEEE members, will frustrate one of the most exciting experiments any professional society has ever undertaken, the attempt to develop a world-wide technical society on an open and voluntary basis. The experiment is already well launched. IEEE sections are now actively operating in about twenty countries; Canada and Europe elect regional directors to the IEEE Board; conventions and symposia have been held in Canada and Europe, in cooperation with national societies when appropriate; and at least one PTG is now planning an international symposium to be held in Tokyo.

Yet much remains to be done. The editors of the IEEE technical publications have a unique opportunity to draw on top talent throughout the world for invited articles and as technical reviewers, an opportunity which if grasped will provide IEEE readers with a richer and more balanced diet. The numerous IEEE technical and standards committees have a special duty to balance the interests of the American majority against the diverse practices and needs of the entire IEEE membership.

As for the professional technical groups, they face an unusually difficult and challenging problem, for they serve technical areas within the profession, and their responsibility is thus geographically as wide as is that of the Institute itself. But whereas the Institute has the financial resources to permit its Board members to travel great distances in the performance of their duties, the PTGs still operate under such slender budgets that they have great difficulty in operating effectively throughout the entire United States.

Although the difficulties are great, the rewards are still greater. There is every reason to expect that those who guide the Institute during the coming decades will succeed in building a society whose scope is truly non-national, but only if the members in the United States are informed of the experiment and are willing to support it.