

The  
**PULSE**  
of Long Island

Vol. 8  
April

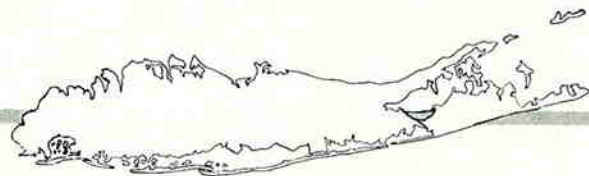
No. 8  
1960

The new . . .



**Fellows of the IRE  
Long Island Section**

**LYNCH — RAU — TOLLES — DEAN — HELLMANN**



**SECTION MEETING — APRIL 12, 1960, Stratford Ave. School**



We would like to report the results of a new rotary joint technique that is arousing much interest with designers of advanced radar systems. This ad has been prepared by Hank Keen of our Department of Applied Electronics.

## Multimegawatt Multichannel Rotary Joints

Earlier publications<sup>1,2</sup> pointed out the usefulness and difficulty of designing slip rings of large diameter at microwave frequencies. These papers recounted how we were successful in solving the problem at low power; we want to now discuss the problem of extension of the same techniques to megawatts.

The problem solved is essentially identical to that of designing a rotary joint capable of being installed "around a mast" (a hole in the center of the joint). The use of a rotary joint having a hole in the middle permits a number of feed lines to pass through it. Simple topological thought will show that if many rotary joints are to be stacked on a common axis, one set of feed lines must go through the center to permit the other set to rotate around it. Accordingly, the more channels required, and the higher the power, the larger the center hole. We have developed techniques for the stacking (one on top of the other) of as many as six multimegawatt rotary joints of this type and are presently considering as many as 12. This stacking capability in a megawatt joint can result in many simplifications to radar systems requiring several antennas rotating on a common axis.

Photographs of an L-band joint are shown in Figures 1 and 2. The basic joint consists of two large diameter very short sections of low impedance coaxial lines so arranged with non-contacting chokes that one section can rotate axially with respect to the other. The key problem is to prevent the establishment in the coaxial lines of any mode except the TEM mode. Very many undesired modes could actually exist on the diameter of typical center holes.

The excitation of these modes must be minimized by a symmetrical power division network, feeding identical signals to equally spaced points about the circumference of the basic coaxial sections. This network, called the binary feed system consists of a series of cascaded tee-junction power dividers, so arranged that the path length from the input to each feed point is identical. The number of feed points

required is a power of two, so chosen that the spacing between adjacent points is less than one half wavelength. In the joint in question, eight such feed points were required.

Further mode reduction is effected by a series of mode filters, which act to interrupt and absorb the circumferential currents which are inherent in the undesired higher-order modes. The actual power lost in this manner

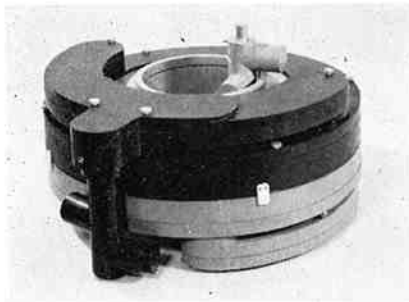


Figure 1

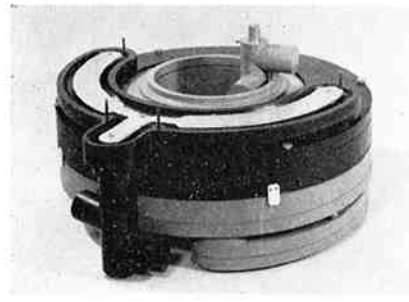


Figure 2

is extremely small, as the function of the mode filters is to reduce the Q of any possible transverse resonance, thereby reducing their ability to absorb power from the rest of the system.

The binary feed network was constructed in high power strip line, with a strip thickness of one quarter inch, and a ground plane spacing of one and one half inches, at the input. By dividing the feed system into two levels, the overall diameter of the joint was reduced, as also was the length of unsupported strip feed. This is an important design consideration, as dielectric support of the strip feed could not be used at this power level. Instead, in order to take full advantage of pressurizing the system with sulphur hexafluoride ( $SF_6$ ) gas, the

binary feed network was supported entirely by quarter wavelength stubs. The number of these stubs must be minimized to avoid loss of bandwidth.

At the outset of the design program, it was determined that a conservative increase of five times in power handling capacity could be expected from the use of  $SF_6$  as compared to air.

A power capacity of two and a quarter megawatts in air at atmospheric pressure was measured in a developmental two channel joint. When  $SF_6$  was introduced at zero psig, a power level of ten megawatts was unable to cause breakdown. The insertion loss of either channel was less than 0.25 db, and an SWR lower than 1.25 was obtained over a twelve percent bandwidth, including the waveguide to coaxial transitions at the input and output of the device.

We think that devices of this type represent an interesting development and are rather happy to see that this type of rotary joint is now finding its way into radar systems. If you desire further information, Hank Keen or Roger Avery will be happy to assist you.

This work was sponsored by the Rome Air Development Center.

### References

1. Fubini, Fromm and Keen "A New Type of Rotary Joint," 1958 IRE Conv. Rec. Part 1, pp. 78-82.
2. "Microwave Slip Rings," September 1958, The Pulse of Long Island.

*A complete bound set of our third series of articles is available on request. Write to Harold Hechtman at AIL for your set.*



DEER PARK  
LONG ISLAND, N. Y.  
MYrtle 2-6100

Advertisement

The PULSE



DR. CHARLES FALK

### About Our Speaker . . .

Dr. Charles E. Falk was born in Hamm, Germany in 1923, and came to the United States in 1938. In 1940 he entered New York University, received his B.S. degree in 1944, and then interrupted his studies to serve two years with the U. S. Army. He received his doctor of science degree in physics in 1950 from the Carnegie Institute of Technology in Pittsburgh. At that time he joined the research staff of the Brookhaven National Laboratory, and for the next three years was active in neutron and charged particle nuclear physics research. He became Administrative Scientist for the newly formed Alternating Gradient Synchrotron Project, which is responsible for the design and construction of the 30 billion electron volt particle accelerator. When completed in 1960 this will be the largest atom smasher in the world. In 1956 he took a leave of absence from Brookhaven to spend two years with the Research Division of the U. S. Atomic Energy Commission in Washington. Upon his return to Brookhaven in 1958 he was appointed Scientific Assistant to the Director.

### March Section Meeting

### Attendance Soars

### To Record High

## Matter and Anti-matter

Throughout history man has searched for those fundamental "building blocks" of nature which might be common to all substances. The history of this search will be reviewed, covering the major chronological developments from the early ideas of fire, water, earth and air to the dramatic discoveries within the last decade of a multitude of new subnuclear elementary particles.

The growth of the elementary particle family will be reviewed, starting with those particles which were discovered relatively early. These were the proton, neutron, electron and photon which made it possible to formulate the classical picture of the atomic nucleus. The advent of the anti-particles will be covered proceeding from early theoretical predictions to later experimental verifications. It will be shown how the discovery of the first meson ushered in an era of many new discoveries of other "building blocks" — the hyperons, mesons and leptons. The important properties of these particles will be described, their role in nuclear interactions discussed, and a presentation given of the pattern which has emerged out of this apparent confusion of new particles. Some of the puzzling questions associated with the study of elementary particles will be discussed such as the origin of the generic term "strange particles."

Since very high energies are necessary to make many of these particles, a brief description of their artificial production by high energy accelerators will be presented. Furthermore, a brief survey will be made of particle detection techniques covering counters, bubble chambers and nuclear emulsions.

### Color Film . . .

Finally, a 30-minute motion picture will be shown entitled "High Energy Particle Accelerators." This movie presents an integrated picture of the magnitude of effort required for study at this major frontier of nuclear science. It reviews the American high energy physics program showing many of the U. S. high energy accelerators, the principles of their operation, and illustrative samples of the research performed at these high energy installations.

### Vote . . .

At the section meeting members will vote for new Section Officers. The nominating committee has named Dr. Henry Jasik for Chairman, Joseph W. Kearney for Vice Chairman, Dr. William T. Cooke for Treasurer and Mr. Henry W. Redlien Jr. for Secretary. No additional nominations were received within the extended deadline set by the Section Chairman.

In addition, members will vote upon the proposed section by-laws, which were presented in the March issue of *The Pulse*.



## From the Chairman:

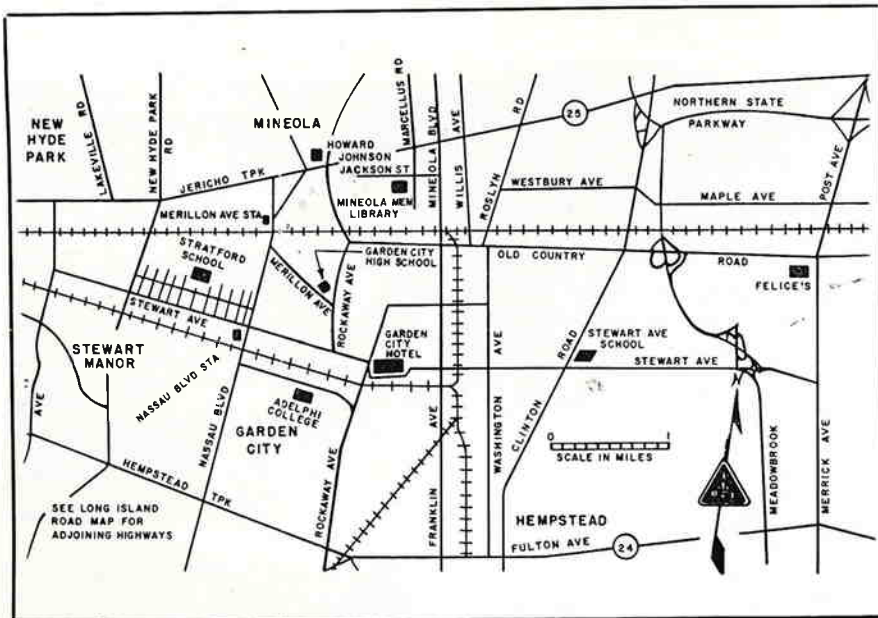
This April marks the 86th Anniversary of the birth of Guglielmo Marconi. Although many other scientists in England, Germany, the United States and Russia had previously contributed in demonstrating that radio communication was possible over short distances, it was Marconi's persistence and determination in carrying out his trans-Atlantic experiments at the turn of the century that brought the first clear-cut proof of practical long distance radio communication. Against the predictions of some prominent scientists and mathematicians of the day which would have limited all radio communication to a near "line of sight" condition, Marconi's incontrovertible experimental evidence clearly had to be believed. Thereupon, various theories to explain his result, including the basically correct concept of a reflecting "layer" in the upper atmosphere, were conceived almost simultaneously by Prof. A. E. Kennelly at Harvard and Oliver Heaviside in England.

Although undoubtedly someone else would have proved the point sooner or later, the fact remains that Marconi did first demonstrate through his tenacity and determination—call it a "hunch" if you will—that great distances could be covered by radio transmissions and that this was a revolutionary and yet practical means of communication. The Morse letter "S" first heard by Marconi across the Atlantic in December 1901 opened a new era in communication, even though the mechanism was not at first understood. A great deal more is now known about the nature and behavior of the ionosphere than at the time of Marconi's death in 1937. However, many aspects are still very imperfectly understood and concentrated research continues, including construction of a huge ionospheric sounding radar, extensive bottom-side sounding throughout the world, top-side sounding from satellites, rocket soundings of ion density, etc.

One cannot help but wonder how Mr. Marconi would react today to the tremendous strides in long distance communication and the myriad developments in electronics since his death. The results of the recent IGY research, radar returns from the moon, sun, Venus, etc., communication satellites, signals from space probes in the vicinity of the moon, "whistler" signals propagated far out along the earth's magnetic field—all these would surely intrigue Mr. Marconi. And what *would* he think of the amazing extent of the recent 1960 IRE International Convention in New York?

One of the most thought-provoking experiments now contemplated is Project Ozma now under way at the National Radio Astronomy Observatory at Green Bank, West Virginia under the direction of Dr. Frank D. Drake. The best available techniques will here be brought to bear on the fascinating task of listening for communications from outer space on the theory that intelligent life must exist outside our own solar system and that somewhere, someone is now trying to communicate with us here on Earth. Let no scientists prove theoretically that this is impossible or so improbable that it isn't even worth trying. Remember Marconi!

—J. GREGG STEPHENSON



# The PULSE

of Long Island

Published by the  
**LONG ISLAND SECTION**  
Institute of Radio Engineers

April, 1960

Vol. 8

No. 8

### EDITOR

Herbert S. Kulik

### MANAGING EDITOR

Elliot Friedman

### BUSINESS MANAGER

Meredith Jones

### ADVERTISING MANAGER

Louise Oliver

### FEATURE EDITORS

#### Historical

Dr. Charles Dean — J. B. Shiel

#### Patents

Len King

#### Personalities

Norman Potter

#### Education

J. Aidala, Shirley Harrison

#### Technical

James Lenehan

#### Sports

Tom Dosch

### ASSOCIATE EDITORS

#### Meeting Notices

Murray Novick

Staff: Geo. Gorelik, S. Kohn

#### IRE Liaison

J. Canning

Staff: W. Feingold, S. Abrahams

### EDITORIAL CONSULTANT

Meredith Jones

### ART CONSULTANT

Robert Cone

Published monthly, except July and August. Editorial and advertising deadlines are the 25th of the second month preceding the month of issue. Address all correspondence to:

### THE PULSE OF LONG ISLAND

Long Island Section, IRE

P. O. Box 789

Mineola, New York

Second-class postage paid at Baldwin, N.Y. Office of publication located at 87 Merrick Road, Baldwin, N.Y. The PULSE is mailed to members of the IRE who give as their address a Post Office in Nassau, Queens, or Suffolk Counties. Subscription fee of \$1.00 included in IRE membership.

Notice: Suitability of all material for inclusion in the Pulse shall be determined by the editor.



**WILLIAM CARBERY**

**Biography of**

**WILLIAM J. CARBERY**

Mr. Carbery received his B.A. in Biology from the Catholic University of America in 1950 and a M.S. degree in Physiological Sciences from New York University in 1956. Since 1956 he has undertaken predoctorate studies in Biophysics at Columbia University.

During the period 1952 to 1954 he was stationed in Germany with the U. S. Army Medical Corps, where he taught military medicine to enlisted men. From 1954 to 1956, Mr. Carbery did research work on chemical problems related to cancer at the New York University Bellevue Medical Center, and blood chemistry research at Doctors Hospital, New York.

Since 1956, Mr. Carbery has had the position of physiologist at Airborne Instruments Laboratory, Department of Medical and Biological Physics. He was responsible for the development of special lead systems and techniques for monitoring electrocardiogram during physical exercise. He has also been engaged in bio-medical-electronics projects including computer analysis and diagnosis of heart disease, development of skin resistance monitoring equipment, psycho-physiological testing and investigations dealing with automatic counting of blood cells.

**PGME-PGEC JOINT MEETING IN N.Y.C.**

A joint meeting of the Professional Group on Medical Electronics and the Professional Group on Electronic Computers will be held at 8:00 P.M. on Thursday, April 14, 1960 at Welch Hall, Rockefeller Institute at 67th Street and York Avenue in New York City.

The subject of the meeting will be 'The Use of Computers as Aide in the Diagnosis of Heart Disease.' The speakers will be William J. Carbery and Charles A. Steinberg both of whom are employed in the Department of Medical and Biological Physics of Airborne Instruments Laboratory. They will discuss a study project which has been undertaken to determine how the high speed and large memory capacity of computers can be of use to the diagnostician. The initial phase of this work involved assessing the feasibility of using modern computer techniques to analyze quantitative physiological measurements of the heart. The physiological measurements were the electrocardiogram, the phonocardiogram, the ballistocardiogram and the arterial pulse wave. Discrete portions of these signals from both normal and pathological subjects were used as the input data for the computer.

A computer routine was evolved to quantitate the differences between the normal and pathological subjects and to use the resultant data to form multidimensional probability functions. Each subject tested was classified with respect to each of three probability functions.

The results of the initial phase of this project showed a statistical quantitation of known differences between the normal and pathological groups and also showed the existence of many highly significant diagnostic indices not presently considered in heart diagnosis.

**Biography of**

**CHARLES A. STEINBERG**

Mr. Steinberg received his B.E.E. degree from the College of the City of New York in 1955 and a M.S. degree in Electrical Engineering from the Massachusetts Institute of Technology in 1957.

In 1955, Mr. Steinberg was engaged in Military Systems Development at Bell Laboratories at Whippany, New Jersey. From 1955 to 1958 he was a research and teaching assistant at M.I.T. His work there included research in the fields of analog and digital computers, ballistic missile systems analysis and development of a special purpose computer for averaging electrophysiological data. He was also engaged in the use of a general purpose digital computer for electroencephalogram studies and in research in psychophysics and audition.

Since 1958, Mr. Steinberg has had the position of Engineer at Airborne Instruments Laboratory, Department of Medical and Biological Physics. He has been responsible for the design of special purpose computers and analog-to-digital conversion systems for bio-medical applications. He has also been engaged in research on the application of computers to analysis and diagnosis of heart disease and in research on information and communication theory as applied to psycho-physiological problems.

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



**CHARLES STEINBERG**

## L. I. PGI

On Tuesday, April 19, 1960 at 8:00 P.M. at the Mineola Memorial Library, Dr. Eugene C. Raka of the Brookhaven National Laboratory will discuss "Beam Observation and Control in the Brookhaven Alternating Gradient Synchrotron."

In the Brookhaven AGS, the vertical and radial position of the circulating proton beam will be monitored at thirty-six stations around the accelerator's one-half mile circumference. Signals induced on electrostatic pickup electrodes will be amplified locally and then transmitted over cables to the control room for processing. The resulting position information will then be used to determine the necessary parameters for proper injection and acceleration of the protons.

During the acceleration cycle the protons will pass through a "phase transition energy" region where orbital stability of the proton beam no longer exists. Because of the close tolerance of the accelerating frequency required at this time, a radio frequency system has been developed employing beam position information in a feedback loop.

A description of the design of these two systems along with a brief discussion of the accelerator itself will be presented.

Dr. Raka attended the University of Michigan where he obtained a B.S. in Physics in 1949, an M.S. in Physics the same year and a Ph.D. in Physics in 1953. He was associated with the electron synchrotron project at the University of Michigan from 1950 to 1953 and has been on the staff of the Brookhaven Alternating Gradient Synchrotron Project since 1953.



**DR. EUGENE G. RAKA**

## L. I. PGMIL

The improvement in submarine technology has increased the speed, endurance, and the depth at which modern submarines can operate, by very large factors. Submarines which formerly were a threat to surface shipping only now have acquired status as strategic deterrents and as possible weapons against fast task forces.

The progress in meeting the submarine threat has been noteworthy. On Tuesday, April 26, 1960, Mr. Frank A. Parker, will discuss the relationship between the increased threat and our increased capabilities. He will examine the functions of detection, classification, and reaction, and will point out the areas where either technical or operational problems exist that deserve further attention by engineers.

The use of new weapons, of new ships like those based on hydrofoil and of new means of detection will be considered in their combination as part of the undersea warfare problem.

### **About the Speaker . . . .**

As the Assistant Director of Defense Research and Engineering for Undersea Warfare of the U. S. Department of Defense, Mr. Frank A. Parker is responsible for research and development activities in all aspects of undersea warfare.

Prior to joining the Department of Defense, Mr. Parker was director of the Atomic Energy Division of the American Radiator and Standard Sanitary Corporation, Mt. View, California. There he organized and managed development of nuclear reactors and other nuclear equipment. From 1951 to 1954, he directed research for the Detroit Controls Corporation, a corporation engaged in the development of special ordnance equipment, military rockets, and electronic and mechanical controls. In 1951, he served as a consultant to the Research and Development Board of the Department of Defense.

From 1946 to 1951, at Princeton University, he directed Project SQUID, a program of research and development of rockets and jet propulsion. From 1941 to 1946, as a Naval officer, he was engaged in rocket research and development.

Mr. Parker received a B.A. degree from John Hopkins University in 1939, and did graduate work there for two years prior to entering the Navy. He is a member of the American Rocket Society and served on its National Board of Directors from 1948 to 1950, and he is a member of the A.O.A. and the A.A.A.S.

## MET. PGMEM

On April 21, 1960 at 8:00 P.M. at the Brass Rail Restaurant, Park Avenue and 40th St., N.Y.C., Dr. Paul R. Beall will speak on "The Briefing For Executive Action."

Industrial and commercial companies of all sizes and in every business have frequent occasions when it would be profitable for them to make informative briefing presentations to their customers or to their owners or workers.

Modern men of industry and science are engaged in forming exact ideas and expressing them in objects made of plastics, steel, and electronic devices—in everything but language. Never before in history have smart men been so dumb—meaning mute. Yet in commerce as well as in government and world affairs it is still appropriate to quote Salisbury, English Statesman of the 19th century who said, "In these days whether we like it or not, power is with the tongue, power is with him who can speak."

Miraculous channels for speech (teletype, television, the cinema, etc.) are in use. Yet channels as such contribute little to the clear expression of exact ideas. "Power is with the tongue" does not mean "Power is with the microphone or automatic multilith machine."

Dr. Beall will explain how any company, using their own personnel for speakers, can successfully articulate and communicate its message to any audience it is able to assemble.

### **Reservations**

For reservations—Dinner at the Brass Rail at 6:30 P.M. (\$3.30), talk, or both, call: Randy Wheeler at Sperry, Great Neck, FI 7-3600, Ext. 8321; or George Comstock at Airborne Inst. Lab., L. I., MY 2-6100, Ext. 323.



**DR. PAUL R. BEALL**

# MEETING NOTICES

## SECTION MEETING

Tuesday, April 12, 1960 at 8:00 P.M.

### **"MATTER AND ANTI-MATTER"**

DR. CHARLES E. FALK — Brookhaven National Laboratories  
Stratford Avenue School, Garden City

MOVIE: "The Ages of Time" (before lecture)      MOVIE: "High Energy Particle Accelerators" (after lecture)

PRE-MEETING DINNER — Stouffers, 1001 Franklin Avenue, Garden City, 5:45 P.M.

## L. I. ISA

Monday, April 4, 1960 at 8:00 P.M.

### **"HUMAN FACTORS PANEL"**

DR. C. SEITZ — Grumman Aircraft Engineering Corp.      Program Chairman: GEORGE TOUMANOFF, AIL  
Dahlstrom's Greentree Lodge, Jericho Turnpike (West of Route 110) Huntington Station, N.Y.

## L. I. PGMTT

Tuesday, April 5, 1960 at 8:00 P.M.

### **"TUTORIAL DISCUSSION ON INFRARED INSTRUMENTATION"**

FREDERICK HARJES - SABERT HOWELL — Servo Corporation of America

Mineola Memorial Library      PRE-MEETING DINNER: Howard Johnson's, Jericho Turnpike, Mineola, 6:00 P.M.

## N. Y. PGMTT

Thursday, April 7, 1960 at 7:00 P.M.

### **"THE ROLE OF PLASMA IN MICROWAVE ENGINEERING"**

Panel Chairman: N. MARCUVITZ, P.I.B.

Members—O. T. FUNDINGSLAND, Raytheon; L. GOULD, Microwave Associates; L. D. SMULLIN, M.I.T.  
Consolidated Edison Building, 4 Irving Place, N.Y.

## L. I. PGEC

Wednesday, April 13, 1960 at 7:30 P.M.

### **"EFFICIENT DESIGN METHODS FOR COMPLEX SWITCHING CIRCUITS BASED ON MATRIX LOGIC"**

DR. ERNEST J. SCHUBERT, Monitor Systems, Inc.

Mineola Memorial Library      PRE-MEETING DINNER: Howard Johnson's, Jericho Turnpike, Mineola, 5:45 P.M.

## N. Y. PGEC-PGME

Thursday, April 14, 1960 at 8:00 P.M.

### **"THE USE OF COMPUTERS AS AIDS IN THE DIAGNOSIS OF HEART DISEASE"**

WILLIAM J. CARBERY - CHARLES A. STEINBERG — Airborne Instruments Laboratory  
Welch Hall, Rockefeller Institute, 67th Street and York Avenue, N.Y.

## L. I. PGI

Tuesday, April 19, 1960 at 8:00 P.M.

### **"BEAM OBSERVATION AND CONTROL IN THE BROOKHAVEN ALTERNATING GRADIENT SYNCHROTRON"**

DR. EUGENE C. RAKA, Brookhaven National Laboratory

Mineola Memorial Library      PRE-MEETING DINNER: McGinnis Restaurant, Mineola, 6:00 P.M.

## N. Y. PGCP-PGPT

Wednesday, April 20, 1960 at 7:30 P.M.

### **"STATE OF THE CAPACITOR ART IN EUROPE"**

LOUIS KAHN — Aerovox Corporation  
Wilkie Memorial Building, 20 W. 40th Street, N.Y.

## MET. PGEM

Thursday, April 21, 1960 at 8:00 P.M.

### **"THE BRIEFING FOR EXECUTIVE ACTION"**

DR. PAUL R. BEALL

Brass Rail Restaurant, Park Ave. and 40th St., N.Y.      PRE-MEETING DINNER: Brass Rail Restaurant, 6.30 P.M.

## L. I. PGMIL

Tuesday, April 26, 1960 at 7:30 P.M.

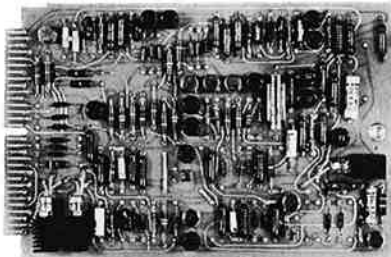
### **"RESEARCH PROBLEMS IN UNDERSEA WARFARE"**

FRANK A. PARKER — U. S. Dept. of Defense

Mineola Memorial Library      PRE-MEETING DINNER: Howard Johnson's, Jericho Turnpike, Mineola, 5:45 P.M.

Louis A. **Garten** & Associates  
Engineering Representatives

**Epsco** TRANSISTOR DIGITAL CIRCUITS



**NOW AVAILABLE**

- ★ NEW 1 mc series or standard 200 kc line
- ★ Encapsulated modules or NEW plug-in cards

Epsco TDC Components will save you time, space and money. Major features include:

- Field-Proven Circuits
- High Loading Capability
- Low Power Requirements
- Completely Compatible
- Vibration Resistant
- Easy-Access Test Points

**SPECIFICATIONS**

Signal Voltage Levels ..... 0 and -6 volts  
 Temperature Range ..... -55°C to +71°C  
 Switching Times

	200 kc	1 mc
rise:	0.7	0.2 $\mu$ sec max.
fall:	1.5	0.35 $\mu$ sec max.

**CIRCUITS AVAILABLE**

- Binary Counters
- Blocking Oscillators
- Clock Multivibrators
- Decade Counters
- Delay Multivibrators
- Diode AND Gates
- Diode OR Gates
- Emitter Followers
- Flip-Flops
- Incandescent Lamp Drivers
- Inverting Amplifiers
- Level Converters
- Neon Lamp Drivers
- Non-Inverting Amplifiers
- Power Amplifiers
- Pulse Shapers
- Delay Drivers
- Transistor Cascade Gates
- Transistor NOR Gates
- Transistor Parallel Gates
- 6, 12 and 18 volt Power Supplies

An introductory kit is available at reduced price.

Call or Write For More Information

**LOUIS A. GARTEN & ASSOCIATES**

645 Eagle Rock Ave., West Orange, New Jersey  
 Redwood 1-1800 • New York: Bowling Green 9-4339  
 Philadelphia Branch • WAverly 7-1200  
 730 Washington Lane, Jenkintown, Pa.

**REPRESENTING**

- Airborne Instruments Lab.
- Div. Cutler-Hammer, Inc.
- Carol Campbell, Inc.
- Cubic Corporation
- Electronic Research Assoc.
- Epsco Components
- Industrial Products Div., IT&T Corp.
- Lavoie Laboratories, Inc.
- Rohde & Schwarz
- Rutherford Electronics Co.
- Sanders Associates, Inc.
- Spencer-Kennedy Labs., Inc.
- Sperry Microwave Electronics Co.
- Weldmatic, Div. Unitek Corp.

**L. I. PGEC**

The Long Island Chapter of PGEC will hold a technical meeting on April 13, 1960 at 7:30 P.M. at the Mineola Memorial Library. Dr. Ernest J. Schubert will speak on *Efficient Design Methods for Complex Switching Circuits Based on Matrix Logic.* A pre-meeting dinner will be held at Howard Johnson's, Jericho Turnpike, Mineola at 5:45 P.M.

Dr. Schubert is the Technical Director of Monitor Systems, Inc., Fort Washington, Pa. The speaker will describe how matrices and their functions, instead of Boolean algebra, offer great efficiency in solving complex logical problems. The concepts of matrix logic are introduced only to the extent that they concern logical designers. The improved matrix methods are applicable for paper and pencil routines as well as computer programs.

With the increasing use of solid state logic and microprogramming concepts, the operators of Boolean algebra are no longer satisfactory. Matrix logic is independent of any specific type of operator and permits design routines in any type of logical elements. The result obtained by the new concept of regression is the minimum solution in terms of hardware without requiring any further minimization. Another original concept discussed is the classification of variables according to the statistical distribution of truth values which, when applied to decoding problems, makes available rapid design routines.

For the design of encoders and control units, a novel concept of implication is presented which drastically reduces the size of the function tables without further minimization. The design of sequential logic using a state matrix to correlate subsequent states with the present states will also be discussed.

Dr. Ernest J. Schubert graduated from the Federal School of Engineering in Vienna, Austria in 1933 and obtained his D.Sc. in Applied Physics from the University of Vienna in 1940.

His distinguished work in Europe has included the responsibility of directing the development of automatic telephone exchanges, and interlocking and remote control installations for large European railroad systems.

More recently he has worked for Westinghouse, Baltimore, Md., assuming responsibility for the advanced development of magnetic computers, and has served as the head of Systems Research with the Burroughs Corporation in Paoli, Pa.

**N. Y. PGMTT**

The PGMTT, New York Section, is holding on April 7, 1960 a panel program entitled *"The Role of Plasmas in Microwave Engineering."* This panel discussion is being held in the Consolidated Edison Building, 4 Irving Place, New York, New York, at 7:00 P.M.

The chairman of this panel is Dr. Nathan Marcovitz of Polytechnic Institute of Brooklyn, Microwave Research Institute. The members of the panel are Mr. Osmund T. Fundingsland, Raytheon Company; Dr. Lawrence Gould, Microwave Associates, Inc., and Mr. Louis D. Smullin of the Massachusetts Institute of Technology.

**PGCP-PGPT**

Starting with application requirements, development of standards and specifications, and the effect of these on the designs and production techniques of capacitors in Europe, Mr. Louis Kahn Technical Assistant to the President, Aerovox Corp., will discuss the *"State of the Capacitor Art in Europe."* His talk will be given at a joint meeting of PGCP and PGPT to be held on Wednesday, April 20, 1960, at 7:30 P.M. at the Wilkie Memorial Building, 20 W. 40th St., Manhattan.

**N. Y. PGMTT**

In January-February of this year the New York Chapter of PGMTT presented a lecture series on Microwave Antenna Theory and Techniques. In chronological order the lectures were: *Fundamentals of Antennas* by Dr. Henry Jasik, *Principles of Traveling Wave Antennas* by Dr. A. A. Oliner, *Reflectors as Antennas* by R. L. Mattingly, *Lens Structures and Artificial Dielectrics* by K. S. Kelleher, and *Microwave Measurements Techniques* by T. E. Tice.

Using fundamental ideas complicated structures were analyzed. The lectures introduced such basic concepts as the effective area and gain of an antenna, radiation from discrete and continuous sources, different types of leaky wave antennas, surface wave antennas and periodic structures, polarization twistors, transreflectors, basic lenses and measurement techniques. The subject matter was augmented by slides of sketches, graphs, and photographs of different antennas. Needless to say, this represented a good deal of time and effort on the part of the speakers who should be complimented for making the excellent series a success.



## COMING ATTRACTION FOR MAY

Nicholas Christofilos was born December 16, 1916 in Boston, Massachusetts. When he was seven Mr. Christofilos moved with his family to Athens, Greece. He was educated in Athens and in 1938 received his degree in electrical and mechanical engineering at the National Technical University in Athens.

From 1938 to 1944, Mr. Christofilos worked for a company specializing in the installation and maintenance of elevators for apartment and office buildings. During the German occupation he pursued his interest in science by reading books on accelerators and applied nuclear physics. After the war, he operated his own electric installation business. He maintained his interest in accelerators by following the literature and proposing new designs. He discovered the "Strong Focusing" principle in 1949. Mr. Christofilos returned to the United States February 5, 1953.

At the end of 1952, Mr. Christofilos conceived the idea of developing a machine for the purpose of controlled release of thermonuclear energy which is known by the name of ASTRON. He disclosed this idea to the Atomic Energy Commission in Washington in February 1953 and subsequently at a Sherwood meeting in Berkeley in April 1953. It was disclosed in a crude form and it took about three years of theoretical work before the proposal for an experimental program was accepted.

On June 2, 1953, he joined Brookhaven National Laboratory and stayed until the end of November 1956. He continued his theoretical studies of the ASTRON idea and also worked with a group who was designing the strong focusing synchrotron.

He developed a theory to calculate the drift tubes of proton linear accelerator theoretically (Reference, Geneva High Energy Accelerator Proceedings, 1st Volume, 1956). The 50 Mev Brookhaven linear accelerator has been designed subsequently according to this theory.

Mr. Christofilos joined the University of California Radiation Laboratory in Livermore on December 2, 1956. His main work in Livermore is connected with the ASTRON. This machine is now in its early experimental stages. It is planned to consist of a circulating layer of very fast electrons situated roughly on a big hollow torus. Around and within this torus a magnetic field is expected to be established which will contain the hot ionized gases which in turn will serve as a fuel in the thermonuclear reaction.

During his work at Livermore, Christofilos suggested in November



**NICHOLAS CHRISTOFILOS**

1957 the injection of fast particles into the earth's magnetic field at high altitude by the help of a nuclear explosion. He worked out the consequences of such an experiment, and in a few months the experiment was carried out under the code name of ARGUS.

### TO BE DISCUSSED

A high current, high energy electron accelerator has been developed and designed at Lawrence Radiation Laboratory at Livermore. As a first step a 2 Mev section is now being built. The beam current is 200 amps, 600 pps, pulse duration .25 microseconds. This accelerator is being built in connection with the Astron experimental program to provide high energy electrons for the Astron electron layer. The peak current of this accelerator is about two orders of magnitude higher than conventional R.F. microwave accelerators. Since the peak power requirements are very high the use of microwave power excitation appears impractical. Hence a very old principle has been employed; namely induction acceleration like in a betatron but with a straight orbit. The accelerator consists of a multitude of axial symmetric cavities loaded with ferromagnetic material (laminated steel, about one mil thickness). By changing the flux in the magnetic material an electric field is generated along the axis of symmetry. The accelerated electron beam travels along the axis. By proper selection of the dimensions of the accelerating

## FIELD TRIP TO SPACE

This year's field trip for the I.R.E. Long Island Section will consist of a tour of Arma Division facility of the American Bosch Arma Corporation in Garden City. The tour will highlight developments by Arma Division in the field of inertial guidance, and will conclude with a dinner in the Arma cafeteria. The trip will take place in June; details will follow in later issues of The Pulse.

## Annual Fellow Award Party

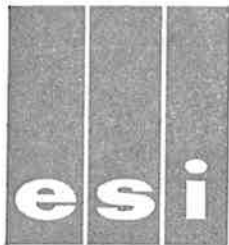
The photograph on the cover was taken at the 1960 Annual Fellow Award Presentation and Cocktail Party, and shows the five newly elected Fellows from the Long Island Section. Since a substantial portion of all I.R.E. section members and their wives were apparently at the Presentation, comments relative to the success of the affair would be superfluous. Certainly the tremendous attendance was a testimony both to the new Fellows, and to the ever increasing popularity of this yearly social event.

**Students Require Obsolete Equipment**  
Professor Manuel Stillerman, Head of the Mechanical Electrical Technology Department of the Bronx Community College has written to The Pulse of Long Island asking for assistance in bringing to the attention of our local manufacturers the need of his school for electronic and electro-mechanical equipment. Professor Stillerman believes that there is quite a bit of obsolete equipment around that is not being used which could still serve to provide excellent training and experience for his students who will soon be entering our industrial complex as young engineers and technicians.

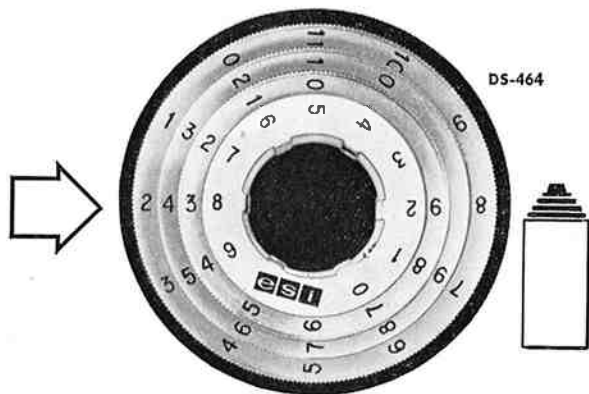
Those with equipment available are requested to contact Professor Stillerman at 120 East 184th Street, Bronx 68, N.Y. His telephone number is Wellington 3-7000.

elements a very uniform field is obtained in the region of the electron beam.

This type of accelerator is very efficient for acceleration of high current (several hundred amps) electron beams. The application of this accelerator in the Astron experiment will be discussed.



# DECADE RESISTORS



**MODEL DS SERIES DEKASTAT®**—Precision decade resistors for panel mounting, featuring the exclusive ESI DEKADIAL® concentric dial assembly for convenient straight line readings. Total resistance values available from 1,200 to 120,000 ohms with accuracy of  $\pm 0.05\%$ . Power rating,  $\frac{1}{2}$  watt per step. 3 or 4 decades of resolution. *Standard units available from stock. Prices: \$63.00 to \$110.00.*

**MODEL DB SERIES DEKABOX®**—Precision decade resistors similar to Model DS series DEKASTAT® units, but conveniently mounted on an adjustable base with binding posts. Features ESI DEKADIAL® design for straight line readings. Total resistance values available from 12,000 ohms to 1.2 megohms with accuracy of  $\pm 0.05\%$ . 3 to 6 decades of resolution. Power rating,  $\frac{1}{2}$  watt per step. *Standard units available from stock. Price: \$73.00 to \$151.00.*

**MODEL RS SERIES DEKASTAT®**—Rack-mounted precision decade resistors. Adjusted to very close tolerances for use as laboratory resistance standards. Independently operated dials provide both coarse initial steps for quickly approximating the required value and progressively finer steps for more exact settings. Less than 10 ppm/C° temperature coefficient. Total resistance values to 1.2 megohms. Accuracy, 0.02%. Six decades of resolution. Power rating,  $\frac{1}{2}$  watt per step. *30-day delivery. Price: \$550.00.*



formerly

**Electro Scientific Industries**  
7524 S.W. MACADAM • PORTLAND 19, OREGON  
**ELECTRO-MEASUREMENTS, INC.**

**Direct toll-free telephone**—In New York City (all five boroughs), Nassau County, L. I., dial operator and ask for **ENTERPRISE 6619**. No Long Distance Charges. If we are not listed in your exchange, call Portland, Oregon collect, **CHERRY 6-3331**. Talk to an ESI Applications Engineer!

ESI has outstanding job opportunities for experienced design and applications engineers. Call or write C. Davis.

## IRE PEOPLE



**JOSEPH W. KEARNEY**

Mr. Kearney is Head of the Department of Reconnaissance Systems at Airborne Instruments Laboratory. He joined AIL in January 1946 as an engineer in the receiver section. From 1946 to 1951, his principal activities were in the field of microwave receiving systems. During this time, he contributed to several counter-measures receiver projects including airborne, shipborne and submarine-borne equipment.

In 1951, Mr. Kearney transferred to the Special Devices Section of Airborne Instruments Laboratory in connection with AIL's early efforts pioneering a modern counter-measures receiver program which has led to today's automatic electronic reconnaissance systems. His activities were thus diversified, at that time, to include pulse type video and digital data handling circuitry as well as microwave receiving systems. In 1953, Mr. Kearney was promoted to Assistant Supervising Engineer in the Special Devices Section at which time he became responsible for much of the continuing effort at AIL in the modern reconnaissance program.

In reorganizing AIL's Research and Engineering Division in 1955, Mr. Kearney was appointed Section Head in the new Department of Special Systems and Components. In early 1958, Mr. Kearney's section was elevated to department status as the Department of Reconnaissance Systems and Mr. Kearney was promoted to his present position of Department Head.

Prior to his joining Airborne Instruments Laboratory, Mr. Kearney was employed as a Special Research Associate at Harvard University's Radio Research Laboratory, the

*Continued on Page 13*

## CORNELL APPOINTS SPERRY SCIENTIST 'HONOR PROFESSOR'



**DR. CHAO C. WANG**

Dr. Chao C. Wang, electronic scientist at Sperry Gyroscope Company, Great Neck, N.Y., has been awarded the coveted Victor Emanuel Distinguished Professorship at Cornell University for the Spring 1960 term, it was announced by Dale R. Corson, dean of the College of Engineering.

Professor Wang, engineering department head for microwave tube research at Sperry, is the fourth recipient of the academic honor, awarded to "persons of broad technical competence whose interests extend into many fields of science and engineering."

Earlier recipients of the professorship, which is sponsored by the Avco Manufacturing Company, were the U.S.'s Dr. Theodore von Karman; Balthazar van der Pol, expert in applied mathematics, and Olof E. H. Rydbeck of Sweden, an authority on upper atmosphere physics.

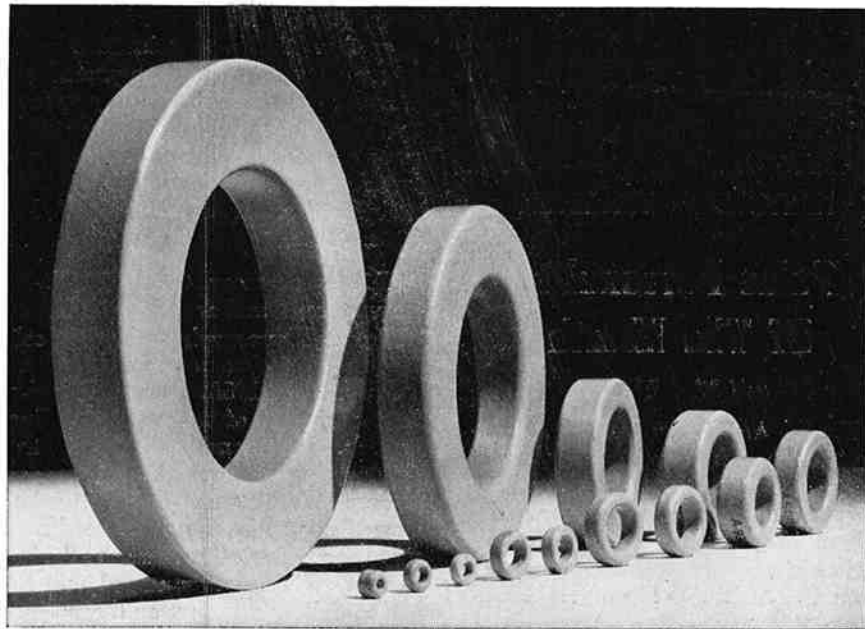
Purpose of the honor is to bring distinguished men "to the Campus chiefly for their ability to stimulate the (Cornell) staff both academically and professionally."

A Sperry research scientist since 1946, Professor Wang is known widely for his many basic contributions in electron physics and the microwave tube field. His work on magnetic focusing systems for electron beams and electromagnetic interaction circuits made possible the construction of extremely high-power radars for United States defense.

*Continued on Page 13*

April, 1960

# ARNOLD: WIDEST SELECTION OF MO-PERMALLOY POWDER CORES FOR YOUR REQUIREMENTS



For greater design flexibility, Arnold leads the way in offering you a full range of Molybdenum Permalloy powder cores . . . 25 different sizes, from the smallest to the largest on the market, from 0.260" to 5.218" OD.

In addition to pioneering the development of the cheerio-size cores, Arnold is the exclusive producer of the largest 125 Mu core commercially available. A huge 2000-ton press is required for its manufacture, and insures its uniform physical and magnetic properties. This big core is also available in three other standard permeabilities: 60, 26 and 14 Mu.

A new high-permeability core of 147 Mu is available in most sizes. These cores are specifically designed for low-frequency applications where the use of 125 Mu cores does not result in sufficient Q or inductance per turn. They are primarily intended for appli-

cations at frequencies below 2000 cps.

Most sizes of Arnold M-PP cores can be furnished with a controlled temperature coefficient of inductance in the range of 30 to 130° F. Many can be supplied temperature stabilized over the MIL-T-27 wide-range specification of -55 to +85°C . . . another special Arnold feature.

Graded cores are available upon special request. All popular sizes of Arnold M-PP cores are produced to a standard inductance tolerance of + or -8%, and many of these sizes are available for immediate delivery from strategically located warehouses.

Let us supply *your* requirements for Mo-Permalloy powder cores (*Bulletin PC-104C*). Other Arnold products include the most extensive line of tape-wound cores, iron powder cores, permanent magnets and special magnetic materials in the industry.

ADDRESS DEPT. P4



# ARNOLD

**SPECIALISTS in MAGNETIC MATERIALS**

THE ARNOLD ENGINEERING COMPANY, Main Office: MARENGO, ILL. 1197R1A  
NEW YORK, Office: 610 E. Palisade Ave., Englewood, N. J.  
Telephone: LOwell 7-4640



**HAROLD A. WHEELER**

## Pulse Personality Of The Month

by **NORM POTTER**

Harold A. Wheeler (F '35), President of Wheeler Laboratories in Great Neck, Vice President of the Hazeltine Corporation, and a distinguished consultant in many phases of communications research, has come a long way from his St. Paul, Minnesota birthplace.

Moving to Washington, D.C. while in his teens, young Wheeler became fascinated with "wireless" and decided to specialize in this field. He attended George Washington University and in his Sophomore year met Professor Alan Hazeltine (F '21) and was fortunate enough to be given the opportunity of working for him in the Stevens Lab during summer vacations.

After receiving his B.S. in Physics in 1925, Wheeler joined the Hazeltine Corporation when it was first formed where he worked on the design of radio receivers. Several years later he originated the diode detector and AVC that came into common use in broadcast receivers. Subsequently he specialized in FM and TV receivers and, in 1940, for his contribution to TV, he was awarded the Morris Liebmann prize by the IRE. In 1939 he was appointed V. P. and Chief Consulting Engineer of Hazeltine Electronics Corporation. During World War II he worked on IFF radar for which he received the Navy Certificate of Commendation. One of his microwave developments, about this time, was later adopted in the DME sets now used for air navigation.

In 1946 Wheeler started an inde-

pendent engineering group which became Wheeler Laboratories, Inc. In talking of those days he remarked, "It was a real gamble. It might have been a good thing and then again it might not." Two of the men who left Hazeltine to work for the new company were David Dettinger (SM '51) who is Chief Engineer and Executive V. P., and Frank H. Williams (SM '54), Assistant Chief Engineer. The company grew steadily and now has laboratories in Great Neck and Smithtown, the latter lab having been opened in 1957 for special R&D work in the antenna field. Two years later Wheeler Laboratories was acquired by Hazeltine with Wheeler himself remaining as President of his Labs but also becoming a Hazeltine V. P. and Member of the Board of Directors.

Holder of more than 150 U. S. patents and author of a series of "Wheeler Monographs," the first collection of which was published as Volume I in 1953, Harold Wheeler is a recipient of many outstanding awards. In February of this year the Engineering Alumni Association of George Washington University bestowed upon him the award of "Distinguished Engineer Alumnus." To earn it, Wheeler commented that he had to deliver a lecture on the subject "Radio Communications with Submarines." He has subsequently been invited to address the IRE Section of Hawaii and plans to give the same speech. "After all," he said, "I put in a lot of work on that speech and, as long as my audiences are so far apart, I might just as well use it again."

The award is given annually to an alumnus who has made notable contributions to his profession.

By putting in a 60-hour week, Wheeler has been able to divide his time evenly between his executive duties and his engineering responsibilities. He still finds time to prepare several papers each year for the IRE and serves on various committees, the most recent being the Industrial Advisory Committee for the Long Island Center for Graduate Study and Research at Farmingdale. Fortunately his home in Great Neck, in which he has lived since 1930, is not too far from his offices and he is thus able to minimize travel time. Wheeler is a Fellow of the AIEE and an Associate Member of the IEE. He has served as a Director of the IRE and has been extremely active in Standards work in addition to many other groups.

# TELEFUNKEN TUBES




Finite  
Electrical  
Tolerance Guarantees

Infinite Superiority  
in  
Performance

Write for  
FREE  
200 page  
Technical  
Manual




**AMERICAN ELITE, INC.**  
48-50 34th Street, Long Island City, N. Y.

DEPT. E

### MEMBERSHIP NEWS

#### Transfer to Senior Member

R. H. RHEAUME  
Brookhaven National Lab.

#### Admission to Senior Member

G. W. REDDEN  
Sage Project Office  
EDSD, Hq. AMC  
New York, N. Y.

W. A. UTLEY  
Navy Material Lab.  
Brooklyn, N. Y.

#### Transfer to Member

E. M. DROGIN  
Airborne Instruments Lab.

E. E. KING  
Riverhead, L. I., N. Y.

HERBERT KRAMER  
Acoustica Associates

A. W. MALANG  
American Broadcasting Co.

STANLEY OKEN  
Ford Instrument Co.

P. R. RUGGLES  
Hazeltine Electronics Div.

STAN SCHENKERMANN  
Richmond Hill, L. I., N. Y.

DONALD SCHULKIND  
Sperry Gyroscope Co.

SIDNEY SMITH  
Sperry Gyroscope Co.

W. H. TROGDON  
Huntington Station, L. I., N. Y.

G. F. WOODARD  
Hazeltine Electronics

#### Admission to Member

J. W. BARNES  
Kollsman Instrument Corp.

Continued on Page 17

## IRE PEOPLE

*Continued from Page 10*

World War II radar countermeasures development facility operated under the government's Office of Scientific Research and Development. At Radio Research Laboratory, he was engaged in the development of several of this country's first microwave intercept receivers.

Mr. Kearney received a B.S. degree in Electrical Engineering from the University of Colorado in 1943. He has also furthered his education by doing graduate work at Polytechnic Institute of Brooklyn. He is a Senior Member of the Institute of Radio Engineers and a Member of the American Institute of Electrical Engineers. He is also a member of Tau Beta Pi and Eta Kappa Nu Honor Societies.

Mr. Kearney's IRE activities include most recently Chairman of the Student Affairs Committee of the Long Island section from 1957 to the present. Prior to that he was active in the Long Island chapter of PGMIT, serving as Vice-Chairman in 1955-56 and Chairman in 1956-57.

He has also served on the section program committee and in connection with his Long Island section assignments has served on the Executive Committee continuously since 1956. In addition to the section activities, Mr. Kearney has served on the Electron Device and High Frequency technical committee and on the IRE National Convention Banquet Committee.

## DR. WANG

*Continued from Page 11*

Professor Wang also developed mathematical techniques which permit electronic computers to yield engineering solutions to complex problems of microwave development.

He was graduated from Chiao-Tung University in Shanghai with a B.S. degree in 1936. He received M.S. and Ph.D. degrees in radio communications from Harvard University in 1938 and 1940.

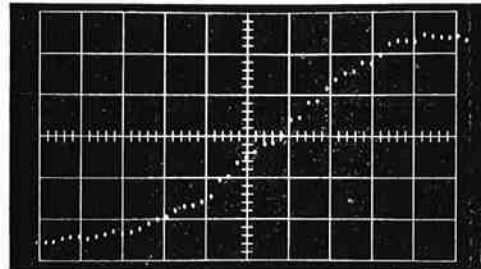
A member of the American Physical Society and the American Association for the advancement of Science, as well as a Fellow of the Institute of Radio Engineers, he has published a number of papers on electronic tube theory and holds several patents.

The Avco Manufacturing Company, Inc., established the two-year visiting professorship in the College of Engineering, Cornell, in the fall of 1957, to be known as the Victor Emanuel Professorship, honoring Victor Emanuel, Cornell Class of 1919, who is a trustee of the University.



## 600-MC BANDWIDTH with the Tektronix Pulse-Sampling System — for all Tektronix Plug-In Oscilloscopes

Rise of a fast pulse generated by the Type 110 and passed through the complete sampling system: Type 110 Trigger Take-off, Type 113 Delay Line, Type N Plug-In Unit. Risettime is less than 0.6 nsec, sweep time is 100 picosec/cm (1 nsec/cm magnified 10 times).

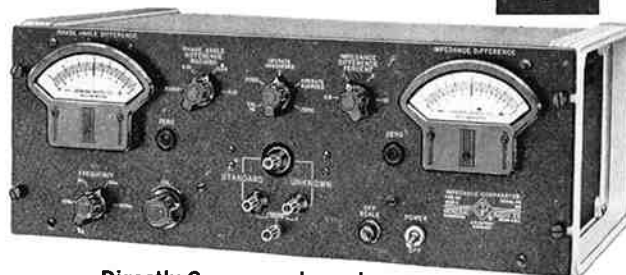


Your Tektronix Field Engineer will be happy to arrange a demonstration of this new low-cost system.

### Tektronix, Inc. Long Island Field Office

840 WILLIS AVE., ALBERTSON, N. Y., Pioneer 7-4830

## A Laboratory Instrument Adaptable to The Production Line!



**Directly Compares Impedances  
Magnitude and Phase Angle Read Simultaneously  
on Two Separate Meters**

- No Balancing
- Wide Frequency Range: 100 cycles to 100 kc
- High Accuracy: Measures to 0.01%
- Wide Impedance Ranges:  
R = 2 ohms to 20 megohms  
C = 40  $\mu$ f to 800  $\mu$ f  
L = 20  $\mu$ h to 10,000 h
- Meter Ranges = Impedance-Magnitude Difference  $\pm$  0.3; 1; 3; 10 per cent, full scale
- Phase Angle Difference =  $\pm$  0.003; 0.01; 0.03; 0.1 radian, full scale
- Terminals for Automatic Selection Devices

**Type 1605-A Impedance Comparator: \$800**

Write for Complete Data

## GENERAL RADIO COMPANY

WEST CONCORD, MASSACHUSETTS

NEW YORK AREA

Broad Avenue at Linden, Ridgefield, New Jersey

Tel: N. Y. WOrth 4-2722 N. J. WHitney 3-3140

George G. Ross Leo J. Chamberlain Peter Bishop Edward F. Sutherland

*a career  
at  
**Transitron**  
will suit you  
to a*



**ENGINEERS  
METALLURGISTS  
PHYSICISTS**

**If You're in Search of a Challenging  
Future and Real Opportunity  
You'll Find Your Professional  
Horizon Unlimited at Transitron**

Due to our rapid growth we now have new and interesting positions available. We would like to discuss your future with you if your background is in Device, Development, Applications, Quality Control, Chemical, Production Engineering; Metallurgy; or Solid State Physics.

Our expansion has created openings with unusual advancement opportunities.

This is a rare opportunity to join with New England's leading semiconductor manufacturer and assume broad and challenging responsibilities.

Salaries and company benefit plans are exceptionally liberal. We will help you relocate to our fine suburban Boston community where an educational environment and individual accomplishments are traditional.



Write or call, Mr. V. A. Metelsky,  
Director of Technical Placement  
in strictest confidence.

**Transitron**  
electronic corporation  
wakefield, massachusetts

**SYMPOSIUM ON  
ACTIVE NETWORKS  
AND FEEDBACK SYSTEMS**

The tenth international symposium organized by the Polytechnic Institute of Brooklyn's Microwave Research Institute will be held on April 19, 20 and 21, 1960 in the Auditorium of the Engineering Societies Building, (33 W. 39th St., in N.Y.C.). This Symposium on Active Networks and Feedback Systems is cosponsored by the Professional Group on Circuit Theory of the Institute of Radio Engineers. The support of the Air Force Office of Scientific Research, the Office of Naval Research and the U.S. Army Signal Research and Development Laboratory makes it possible to hold this event without any charge for admission or registration.

This series of annual symposia has been attended by as many as 940 Scientists and Engineers in past years. Previous topics have included: Non-linear Circuit Analysis (1953 and 1956); Modern Network Synthesis (1952 and 1955), Information Networks (1954), and four others on Millimeter Waves 1959, Microwave Techniques, Solid State Phenomena and Electronic Waveguides. As in the past, recognized authorities will summarize the present state of the art and recent outstanding advances will be presented by research workers from university, industrial and government laboratories throughout the world.

Abstracts of all papers, a detailed program and registration form are available from:

The Microwave Research Institute  
Polytechnic Institute of Brooklyn  
55 Johnson Street  
Brooklyn 1, N. Y.

**Associated Research Inc.**—AC and DC HV Testers, Insulation Testers.

**Roller-Smith** — MIL Spec. Ruggedized Meters.

**Struthers-Dunn Inc.**—Miniature Relays, Open and Sealed types, for Industrial and Military Use.

**PROMPT SHIPMENTS**

**Kahant Associates**

11 Park Place, N.Y.C.

CO 7-5326

**WHEELER LABORATORIES, INC.**

Consultation — Research — Development  
Microwaves — UHF — VHF — VLF  
Antennas and Components

Harold A. Wheeler and Engineering Staff  
HUnter 2-7876 Great Neck, N. Y.  
Antenna Laboratory Smithtown, N. Y.

# NEW!... CONVERTS AC to DC LINEARLY

from 1 mv to 1000 v

Accuracy of conversion

Is **BETTER THAN 0.25%**

for frequencies 50 cps to 10 KC



Price \$450

## BALLANTINE'S LINEAR AC to DC CONVERTER Model 710

The Model 710 Linear AC to DC Converter converts an AC voltage to a DC voltage which can be measured with an accurate DC device such as Type K Potentiometer, Digital DC Voltmeter, Recorder, etc. With such a combination, a wide range of voltages can be measured with up to 0.25% accuracy, which is considerably better than accuracies of present-day vacuum tube voltmeters. Such a system is more sensitive, covers a wider frequency and voltage range, and is much more rugged and foolproof than a laboratory standard instrument of comparable accuracy. It is also adaptable for use by untrained personnel and on production lines.

The instrument covers an input voltage range of 1 mv to 1000 volts which is divided into six decade ranges. For every decade range the DC output varies from 0.1 volt to 1 volt. The input impedance of the converter has a resistive component of 2 megohms shunted by 15 pf to 25 pf, depending on the range.

The output of the Model 710 Converter is a linear function of the input voltage within each decade. A small error may exist in the decading of the input attenuator or in the frequency response of the amplifier. This error does not exceed  $\pm 0.25\%$  over a frequency range of 50 cps to 10 KC and  $\pm 0.5\%$  over a range of 30 cps to 50 KC. The upper frequency limit of the instrument is 250 KC, at which point the accuracy is  $\pm 1\%$ .

The DC output of the converter is single ended and has a maximum output emf of 1 volt with a source impedance of approximately 10,000 ohms. The instrument is the average responding type for distortions as much as 30%, but is calibrated in RMS of a sinewave.

Also available in 19 inch relay rack as Model 710S/2 Price \$455

Write for brochure giving many more details

— Since 1932 —



**BALLANTINE LABORATORIES INC.**

Boonton, New Jersey

CHECK WITH BALLANTINE FIRST FOR LABORATORY AC VACUUM TUBE VOLTMETERS, REGARDLESS OF YOUR REQUIREMENTS FOR AMPLITUDE, FREQUENCY, OR WAVEFORM. WE HAVE A LARGE LINE, WITH ADDITIONS EACH YEAR. ALSO AC/DC AND DC/AC INVERTERS, CALIBRATORS, CALIBRATED WIDE BAND AF AMPLIFIER, DIRECT-READING CAPACITANCE METER, OTHER ACCESSORIES.

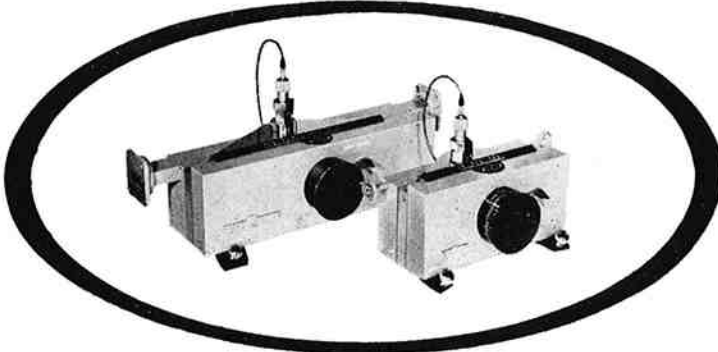
Represented by **GAWLER-KNOOP COMPANY**

178 Eagle Rock Avenue -- Roseland, N.J. -- Caldwell 6-4545



# Standing Wave Detectors

— *exceptionally accurate*



You get the accuracy that results from perfect parallelism between slot and waveguide axis... between probe travel and waveguide axis. You get precise indication of the probe position during travel. Residual VSWR in the waveguide is minimized by one-piece construction that provides a uniform path for measured waves.

**Time-saving.** It takes only 30 seconds to equip a D-B slotted line to measure adjacent frequency bands. Only two sizes of carriage units, plus different-size waveguide blocks and probes, cover all frequencies from 5.8 KMC to 140 KMC. Your budget goes farther with D-B units. Write for complete data.



**DE MORNAY-BONARDI**  
780 SOUTH ARROYO PARKWAY • PASADENA, CALIF.

**L & M ASSOCIATES** 22-02 RAPHAEL STREET, FAIRLAWN, N. Y.

## Complexity and Opportunity at RCA Moorestown!

Advanced projects such as the Ballistic Missile Early Warning System (BMEWS) and the Downrange Anti-ballistic-missile Measurements Program (DAMP) have created new openings for engineers, scientists, and engineering managers with experience in:

**DEVELOPMENT AND DESIGN—Antennas, Digital Computers, Microwave Circuitry and Components, Receivers and Displays, Transmitters • MILITARY SYSTEMS ANALYSIS • RADAR PROJECT ENGINEERING • DATA REDUCTION AND COMPUTATION**

These career positions are in RCA's modern facility at suburban Moorestown, New Jersey. Salary is commensurate with experience. Advancement is rapid.

*To arrange a confidential interview, send résumé to:*

Mr. W. J. Henry, Dept. V-32-D



**RADIO CORPORATION of AMERICA**

Moorestown Missile and Surface Radar Division  
Moorestown, New Jersey • (20 Minutes from Philadelphia)

## Ballaine Named VP and Executive Director of Adelphi Research Center

President Paul Dawson Eddy announced that Doctor Francis Knight Ballaine, Dean of Adelphi College, Garden City, Long Island, N.Y., has been assigned full time to the post of Vice President and Executive Director of Adelphi Research Center, Inc., a non-profit research corporation devoted to basic and fundamental research in biology, chemistry, mathematics, physics and the human behavioral sciences.

A resident of Kew Gardens, Queens, N.Y., Doctor Ballaine studied at the University of Washington in Seattle; Brown University (A.M.) in Providence, R.I., and received his Ph.D. at Columbia University in 1936.

Doctor Ballaine's undergraduate training at the University of Washington was mainly in civil engineering; his graduate work at Brown University, and later at Columbia University, in Philosophy and Psychology.

Doctor Ballaine's responsibilities will be to work with the Executive Committee of the Board on the expansion program, conduct a search for an outstanding scientist to be appointed Director of Scientific Research, locate an acceptable site for the center, and recruit additional research personnel.

"The importance of basic research in the physical and mathematical sciences today," said President Eddy, "is known and accepted by everyone. What is not so well known is the fact that to accomplish the dramatic events of putting a satellite into orbit, or sending a rocket to the moon, is the vast amount of preliminary work that must be done in the area of pure research before the applied engineering designs can even begin to take rough shape. Adelphi Research Center, Inc., is interested only in this pure research effort to widen our horizons of knowledge."

Evidence of the increasing importance to the nation of the academic based research center is dramatically clear from figures recently released by The National Science Foundation. The Foundation reports that, "during the period from 1953-54 through 1959-60 the Nation's total funds for research and development will increase from an estimate of slightly over five billion dollars to a projected estimate of twelve billion dollars."

The N.S.F. singles out for special  
*Continued on Page 17*



## BALLAINE

Continued from Page 16

mention "the college and university sector as a performer of research, especially basic research" and reports that the Federal Government continued to be the dominant source of university research funds, "furnishing over 60 per cent of the total." Such dominance, continued the N.S.F. report, "stemmed in part from the flow of Federal funds to contract research centers administered by colleges and universities . . . these centers accounted for 27 per cent of all funds expended by the college and university sector in 1956-57."

While no one has exact comparative figures, it is safe to say that in number of companies, size, and capabilities, the electronics industry on Long Island is rivaled only by that around Boston, San Francisco, and Los Angeles. The expansion of Adelphi Research Center, Inc., will enable it to better serve this rapidly growing industrial complex with its tremendous need for basic research in the physical, chemical, and mathematical sciences.

## MEMBERSHIP NEWS

Continued from Page 12

MICHAEL BARTOLOTTA  
Western Union Tel. Co.  
D. L. COYLE  
Hazeltime Electronics  
S. A. KENNEDY  
General Precision Lab.  
D. D. KIRSCHNER  
F X R, Inc.  
J. F. LASTRA  
Airborne Instruments Lab.  
JOHN MAHLER  
Intercontinental Elec. Corp.  
S. R. MANNARINO  
Sperry Gyroscope Co.  
L. J. MURPHY  
Western Electric Co.



## WET SLUG

Tantalytic® capacitors give high volt-microfarad values, high capacitance, small size. For instance, 325 MFD at 6 volts in case size 0.225" x 0.875".

Instant delivery at factory prices from

 **Schweber**  
**ELECTRONICS**

60 HERRICKS ROAD, MINEOLA, L. I., N. Y. PIONEER 6-8930. TWX G-CY-NY-880U

## FIRST ARMY MARS TECHNICAL NET ANNOUNCES SPEAKERS FOR APRIL

Continuing with its mission of disseminating technical knowledge by radio communication, the First U. S. Army MARS SSB Technical Net announces its speaker program for April.

The net operates each Wednesday evening at 9 P.M. (New York Time) on 4030 KC upper sideband.

Arrangements have been made by Ted Mathieson, A4FJ, the state MARS Director of Virginia, to use First Army Tapes in setting up a Second Army Technical Net with its nucleus around the Washington, D. C. area.

Speakers for April include:

- April 6 "Filter Design and Applications" by James L. Prather, Instructor, Radio Division, USASCS, Fort Monmouth, New Jersey
- April 13 "New Semi-Conductors for High Frequency Circuits" by W. A. McCarthy, Chief Applications Engineer, Semi-Conductor Division, Raytheon Mfg., Co., Boston, Massachusetts.
- April 20 "Modern Trends in Electronic Instrumentation" by Walter A. Knoop, Jr., Partner, Gawler-Knoop Company, Roselle, New Jersey.
- April 27 "Tacan and Similar Aircraft Navigation Systems" by William Loebel, Project Engineer, Olympic Radio & TV Division of the Siegler Corp., Long Island City, New York.

**NOW AVAILABLE, IN-STOCK TRANSISTOR REGULATED POWER SUPPLIES FOR CUSTOM APPLICATIONS FROM A PIONEER IN THE FIELD.**

## DELTRON, INC.

4th & CAMBRIA STREETS, PHILADELPHIA, PA.

**For narrow voltage bandwidth applications.**

The LH series covering any 2 volt band from 1 volt to 100 volts in all even numbered currents steps up to 20 amperes.

**For wideband voltage applications.**

The H and HP series continuously adjustable from zero to 150 volts, models up to 15 amperes.

**For compact plug-in applications.**

The PI series covering from 1 volt to 50 volts, current up to 2 amperes.

Also rack mounted and plug-in constant current sources.

**For Information Contact:**

**DuBOVY ASSOCIATES**

144-45 35th Avenue, Flushing, N.Y.  
Telephone FLushing 3-6963

# A SYMPOSIUM IS BORNE

by F. P. CARUTHERS

EDITOR'S NOTE: There is hardly an engineer around who has not at one time or another attended a Symposium. How many of us have ever given any thought to the question of how they originated? There has to be a single point in space and time where someone says "Wouldn't it be a good idea to have a Symposium." Recently your editor confronted Phil Caruthers and asked him to explain how the Symposium On Adaptive Control Systems got started. Phil is the chairman of the Symposium. His answer is printed below.

One day about a year and a half ago, I happened to mention to Dr. Hellman that I would like to do something for the Long Island Section of the IRE. This "innocent" little statement certainly led me into quite a series of new and interesting fields.

In December, 1959, Dr. Hellman suggested we have lunch together at Felices to discuss the idea. Upon arriving, I found Dr. Mundo and Mr. Eisenman there to join us. After I was comfortably seated (so I couldn't get away), Dr. Hellman said that they would like to take me up on my offer of assistance. I was thereupon appointed Chairman of a Symposia Committee. I was informed that nothing like this had ever been attempted so they could give me no precedent to go on, only advice. Still willing to try anything that sounded interesting, I accepted.

Four subjects were suggested:

1. Space Threshold Electronics
2. Business and Legal Aspects of Engineering
3. Sensing and Servo
4. Medical Electronics

During the next few months, several Conferences and Conventions were attended by various members of the Symposia Committee and a particular subject "Adaptive Control" seemed to stand out as one which many people were either attempting to define or telling of experiments in this field. Each time the speaker described an experiment, he ended the statement "... this is as far as we have gone and we don't know the answers yet."

After discussing this point, it was agreed that a Symposium on Adaptive Control Systems in late 1960 would be the appropriate time for a full discussion of such a subject. When it was presented to the Executive Committee, unanimous approval was received.

H. Levenstein and J. Eisenman were appointed Chairmen of the Technical Program Committee and Facilities Committee, respectively. A letter to IRE headquarters requesting their sanction received an immediate approval with the comment that they felt we should double our attendance estimates since we had picked one of the "hottest" control subjects for our Symposium.

Other societies and institutions were contacted, and they offered as-

sistance in any way possible. We took them up on it. We put their representatives to work. Professor John Truxal, of Polytechnic Institute of Brooklyn, said that they had been asked by the Armed Services to give a Symposium on the same topic. He was so enthused about our efforts that he suggested an alternative subject for their Symposium in order not to conflict with us. As a result, PIB has been working very closely with us in obtaining speakers and other information.

Our list of co-sponsors has grown to include the following organizations:

MILITARY RESEARCH AGENCIES  
*Air Research and*

Development Command  
Office of Naval Research  
LONG ISLAND PROFESSIONAL GROUPS  
*American Institute of  
Electrical Engineers  
American Society of  
Mechanical Engineers  
Instrument Society of America  
Professional Group on  
Automatic Control*

EDUCATIONAL INSTITUTIONS

*Adelphi College  
Hofstra College  
Polytechnic Institute of Brooklyn*

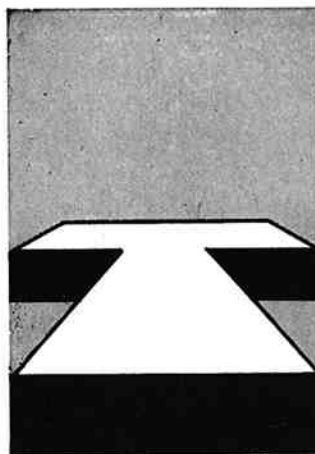
AND

*The New York Professional Group  
on Automatic Control*

*The New York Section of the IRE*

When our committee started working, we had no idea how to go about organizing such a Symposium or what the budget should be. I was amazed at the resources of the various committee members and the vast amount of help available. Both the IRE and the AIEE supplied us with data on the functions and responsibilities of each committee. The AIEE sent us a complete budget breakdown on similar sized conferences. The ISA lent us a complete (2 full books) report on one of its

*Continued on Page 19*

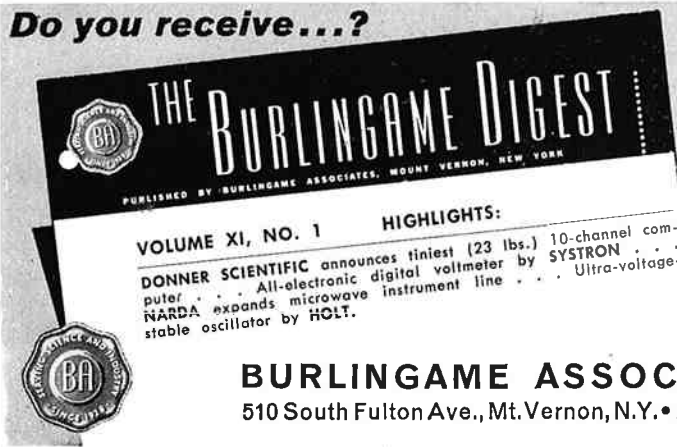


## BIMODAL BROAD BAND NOISE SOURCE

Tucor announces a new concept in noise generation for applications from UHF through S band—bimodal operation, which permits the Tucor T44U1C coaxial tube to achieve frequencies of 200 to 4000 Mc. Due to its high power-handling ability, the tube is suited for use in areas of high power concentration, such as antenna lines. Full particulars are available from Tucor, Inc., 18 Marshall Street, South Norwalk, Connecticut.

# TUCOR, INC.

Do you receive...?



Your Burlingame Field Engineer will be happy to have your name added to the digest list. No charge, of course.

**BURLINGAME ASSOCIATES, LTD.**  
510 South Fulton Ave., Mt. Vernon, N.Y. • MOUNT VERNON 4-7530

## ADAPTIVE CONTROL

*Continued from Page 18*

Symposia. The Office of Naval Research contacted some of its branches in Europe and came up with the names of several of the top men overseas working in this field. Polytechnic Institute of Brooklyn has been combing its list of several hundred men in Adaptive Control work in the United States.

The interest we have found in everyone we have contacted has been very strong. One of the most interesting points is the question invariably asked whenever the subject was mentioned, "Just what is an Adaptive Control System?" One such discussion went as follows after a general description of what it meant:

"If you asked 500 people you would get 500 different answers."

"If you asked the same 500 people the same question the next day, you would get another 500 different answers."

"Yes, their own adaptive systems may have learned something new since the day before."

This is just one of the questions we intend to answer at the Symposium on Adaptive Control Systems.

F. P. CARUTHERS

Chairman, Symposia Committee

### KLYSTRON

To electrically and mechanically design and develop broadband and super high power Klystron tubes.

### TRAVELING WAVE DEVICES

To join a development team on high and low powered Traveling Wave Tubes and Carcinotrons.

### CROSSED FIELD DEVICES

To perform advanced research on Crossed Field Amplifiers.

### BARRATRON®

To carry on development work on this new and unique microwave product.

### MAGNETRON

To perform unique design work in both the CW and Pulse type tube areas.

Openings exist in these product line areas for Junior, Intermediate, and Senior level engineers.

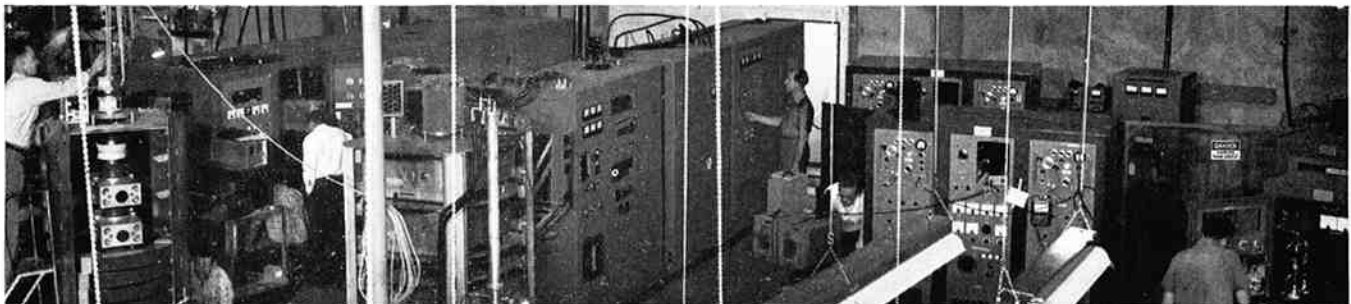
## MICROWAVE TUBE ENGINEERS

If you qualify for any of these positions, contact our Eastern Technical Representative for an interview, 55 Church St., White Plains, N.Y. ROckwell 1-0565



### LITTON INDUSTRIES

Electron Tube Division  
San Carlos, California



## SENIOR PROJECT, PROJECT, & JUNIOR ENGINEERS

*come to the San Francisco Peninsula*

*work on transmitters, modulators, r-f  
signal sources, pulse transformers*

You can expect to gain rapid recognition at Levinthal in a growing organization with an engineering top management. Use your experience to greatest advantage in a concern whose chief activity is the development, design, and production of equipment for radar, communications, particle acceleration, propagation research, and missile guidance.

*enjoy outstanding employment benefits*

Combined with the opportunity to assume high-level responsibilities at Levinthal, you will receive health

benefits, life insurance, participation in the company's profit-sharing plan.

*locate in an outstanding center of electronics*

Palo Alto has one of the most favorable climates in the world and offers the best in housing, recreation, schooling, and the technical stimulation which has centered here in the birthplace of electronics.

Levinthal is located in Stanford Industrial Park, adjacent to Stanford University where opportunities are provided for work on advanced academic degrees.

*act now*

Write today, including your resume to:  
Albert J. Morris; Senior Vice President, Engineering

## LEVINTHAL ELECTRONIC PRODUCTS

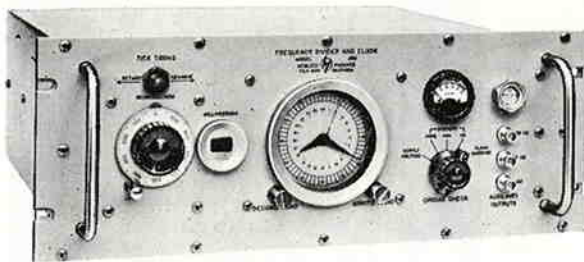
STANFORD INDUSTRIAL PARK PALO ALTO, CALIFORNIA



SUBSIDIARY OF  
**RADIATION**  
INCORPORATED

# NEW INSTRUMENTS

## ACCURATE COMPARISON OF WWV SIGNALS WITH THE -hp- 113AR



The Hewlett-Packard Model 113AR frequency divider and clock provides a simple and accurate method for comparing frequency standards to WWV by making the comparison on a time basis, thereby averaging out the daily frequency variation due to atmospheric and other effects. The -hp- 113AR consists of a clock, driven by a 1 KC signal developed previously from the 100 KC output of the frequency standard under test. This provides gated pulses at one second intervals. A precision resolver between the divider and clock is utilized to shift the time of the output pulses which are then used to trigger an oscilloscope sweep for time comparisons. When the WWV pulse and the gated pulses are coincident, as observed on the scope, the resolver reading becomes an indication of relative accuracy. A regenerative frequency divider provides fail-safe operation by shutting off the clock should the 100 KC or DC power fail, even momentarily.

Input frequency . . . . 100 KC  $\pm$ 300 cps

Effect of transience . The -hp- 113 AR will not gain or lose time because of: (1)  $\pm$ 300 volt step function on 100-KC input; (2) 0 to  $\pm$ 50 volt pulses, 0 to 500 pps, 1 to 10  $\mu$ sec. duration on 100 KC input; (3)  $\pm$ 4 volt step in 24v DC input.

## VARIAN ANNOUNCES NEW TWO-CHANNEL STRIP CHART RECORDER



Varian Associates, a leader in scientific instruments and microwave components, now offers a two-channel strip chart recorder for independent variables. Ink of two contrasting colors provides easy channel identification, and the two pens are mechanically and electrically completely independent.

Operating on the principle of the null-balance potentiometer, the Varian Model G-22 Recorder, like the single channel G-11 model, combines high speed rectilinear recording with excellent sensitivity and accuracy. This recorder is a rugged portable unit that has been designed to be equally effective for panel or rack mounting. Many optional features, such as ink-less recording, variable chart speed, event markers and plug-in input chassis are available or are currently under development.

Specifications on the G-22 Recorder with optional A-21 input chassis are noted below. For more detailed information on other flexible combinations available with the G-22 contact your RMC field engineer.

Full scale balancing time . . 1 second  
 Maximum error . . . . . 1% of span  
 Reference system . . . . . Mercury cell  
 Sensitivity . . . . .  $\frac{1}{4}$ % of span  
 Input impedance . . . . . Infinite at null  
 Span . . . . . 9 to 100 mv  
 Dimensions & wt. . . . . 11 $\frac{3}{16}$ " h x 12 $\frac{3}{4}$ " d x  
 8 $\frac{5}{16}$ " w, 35 lbs.

# rmc

FOR MORE INFORMATION PHONE OR WRITE

## A S S O C I A T E S

FIELD ENGINEERS • ELECTRONIC INSTRUMENTATION

236 East 75th Street, New York, New York • TRafalgar 9-2023  
 391 Grand Avenue, Englewood, New Jersey • LOwell 7-3933