EDITOR’S PROFILE of this issue
from a historical perspective ...
with Paul Wesling, SF Bay Area Council GRID editor (2004-2014)

September, 1961:
Cover: Dr. Bernie Widrow demonstrates the ADaptive LINEar machine (ADALINE), mimicking the brain’s neuron and synapse system, based on the memistor (now known as the memristor). This “device” was then postulated mathematically in a paper in 1971 by Prof. Leon Chua of UC-Berkeley and Steve Kang (later a Prof/Dean at UC-Santa Cruz, then president of KAIST, and an IEEE Fellow) -- as a result of symmetry, there should be a fourth basic device (in addition to R, L, and C). The instantiation shown here is slow – based on using a liquid electrolyte (lower photo) and electroplating to create a variable resistor with memory. When we finally achieved nanometer-level plating, control and metrology in the 2000’s, Stan Peters of H-P made practical memristors; I was an endorser for Stan’s IEEE Fellow nomination. Stan’s practical discovery answered a number of puzzling phenomena that had been seen for years but remained unexplained. Now memristors are showing up experimentally in computer architectures and other applications.

p. 14: Bill Hewlett gets an Award of Excellence in the Industrial Design competition; Arnold Beckman was the luncheon speaker; Lloyd Berkner of the National Academy of Sciences says that the best window for landing men on the moon is 1975; before that, the issue is sunspots and the resulting radiation exposure.
Bomac presents a state-of-the-art advancement in high-power, low-frequency duplexers. Applications include a wide variety of radar services and systems.

These duplexers are available in both waveguide and coaxial line configurations. Peak power ratings: 1 Mw to 25 Mw. Frequency range: 450 to 9600 Mc. Life expectancy: greater than 2000 hours.

Improved window design provides increased radar capability. Arc loss: much less than 0.1 db. Recovery time at high power is the fastest of any gas switching duplexer on the market. With increased power, recovery time increase is negligible.

Write for additional information, including power level and frequency desired.
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Arnold core products covered by this warehouse stock program include: 1) Silectron C, E and O cores in 2, 4 and 12-mil tape. 2) Type 6T aluminum-cased cores of Deltamax, Square Permalloy and Supermalloy, in 1, 2 and 4-mil tape. 3) Mo-Permalloy powder cores, both temperature-stabilized and unstabilized types, ranging down to "cheerio" sizes. 4) Iron powder toroids, threaded cores and insert cores.

All four products are available in a wide range of selection, for your convenience and economy in ordering either prototype design lots or regular production quantities. • Stock lists, bulletins, etc. are available—write for information. The Arnold Engineering Company, Marengo, Ill.

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You’ll work with the greatest team of electronic representatives in the country. You’ll sell and service the products of another great team—the nine leading electronic manufacturers represented by Neely. The highest batting average in the industry is potentially yours as a member of the Neely team—and a lifetime playing contract.

The Neely diamond has 8 bases in California, Arizona, Nevada and New Mexico. After training, you may be able to play your choice of positions.

It’s the top of the first inning and the team is waiting. For information, an interview...and maybe some testing at home plate, check in at the Neely dugout. Call or write Mike Talbert, Senior Staff Engineer and Head Coach.

Batter up? Let's play ball!
Dr. Bernard Widrow, Stanford Electronics Laboratory staff member, shows Adaline I while Adaline II stands by on the table. Based on newly developed memistors, seen getting a haptic of electrolyte below, the Adalines are building blocks for an intelligent computer, capable, like the human nervous system, of learning to adapt to changing requirements. Adaline is an acronym for ADaptive LINEar classification machine.

Adalines can be taught to respond reliably with positive or negative outputs to the identity of letters of the alphabet and other geometric shapes. Teaching is done by manipulating resistances—potentiometers in the case of Adaline I, memistors in Adaline II. These three-terminal liquid-state devices have internal resistances that are variable by the application of a reversible electroplating current.

Adaline, shown in the center, comprises six Adalines and is a Multiple ADaptive LINEar classification machine, whose outputs are the result of majority decisions among individual Adalines.
MEETING CALENDAR

SAN FRANCISCO SECTION  
(Joint meeting with PGEM) (Tentative)

EAST BAY SUBSECTION  
“An Effect in Research”
Speaker: Dr. Herbert Bandes, Arthur D. Little Co., Inc.
Place: Marsh Creek Springs Park
Picnic lunch: Noon
Reservations: Winopher Veeder, Thornhill 3-2740, Ext. 5451; or Chris Widerg, Hilltop 7-5100, Ext. 2470

PROFESSIONAL GROUPS

Audio  
(Joint meeting with Society of Motion Picture and Television Engineers)  
“A Very Directional Condenser Microphone” and “Acoustical Considerations in the Design of a Sound Studio”  
Speaker: Michael Rettinger, RCA  
Place: Studio “A,” KGO-TV  
Dinner: 6:30 P.M., Rathskeller Restaurant, 602 Turk Street, San Francisco  
Reservations: Stan Oleson, DA 6-6200

Circuit Theory  
“Quantized Probability Design”  
Speaker: R. B. Hurley, advisory engineer, IBM, San Jose  
Place: Main Conference Room, Stanford Research Institute

Communications Systems  
“The Videograph Process—A New Approach to High-Speed Printout and Display”  
Speaker: W. E. Evans, A. B. Dick Research & Development Lab  
Place: A. B. Dick Research & Development Lab, 3950 Fabian, Palo Alto  
Dinner: 6:30 P.M. (Social Hour 6:00 P.M.), The Red Shack, 4085 El Camino Way, Palo Alto

Electronic Computers  
“Computers in Operations Research”  
Speaker: Ernest Koeningsberg, CEIR, San Francisco  
Place: Lockheed Auditorium, 3251 Hanover Street, Palo Alto  
Dinner: 6:00 P.M., The Red Shack, 4085 El Camino Way, Palo Alto  
Reservations: None required

Engineering Management  
(Joint meeting with San Francisco Section, see above)

Space Electronics & Telemetry  
“Multiple Frequency Antenna System for Satellite Tracking and Communication”  
Speaker: L. G. Ettling, Philco  
Place: Lockheed Auditorium, 3251 Hanover Street, Palo Alto  
Dinner: 6:30 P.M., Old Plantation, 1030 N. San Antonio Road, Los Altos  
Reservations: Cynthia Chaney, DA 6-4350, Ext. 2266 by Sept. 18

CHRONOLOGICAL RECAP

September 19—Space Electronics & Telemetry  
September 20—Communications Systems  
September 24—East Bay Subsection  
September 26—Electronic Computers  
October 4—Circuit Theory  
October 17—Audio/SMPTE  
November 29—San Francisco Section/Engineering Management
# MEETING SCHEDULE 1961-1962

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**September 1961**
- 12: PGIT, PGRFI
- 13: PGB, PGEM
- 19: PGSET
- 20: PGCS, PGBME, PGSET
- 24: EBSS
- 26: PGECS, PGBME, PGBAP, PGRQC
- 30: IBSS

**October 1961**
- 3: PGI, PGB, PGMIL
- 4: PGC
- 11: PGAP
- 17: PGBME, PGBSET
- 24: PGBME, PGBSET
- 26: PGBSET
- 30: PBSS

**November 1961**
- 1: PGB, PGBSET
- 7: PGB, PGMIL
- 8: PGBAP, PGBM, PGED
- 14: PGRFI
- 15: PGBM, PGBME, PGBSET
- 21: PGBM, PGBSET
- 22: PGBCS

**December 1961**
- 5: PGMIL
- 6: PGB, PGBSET
- 13: PGBAP, PGBM, PGBSET
- 19: PGBAP

**January 1962**
- 2: PGB, PGMIL
- 3: PGB, PGBSET
- 9: PGBAP, PGBM, PGBSET
- 10: PGBM, PGBSET
- 16: PGBED

**February 1962**
- 6: PGB, PGMIL
- 7: PGB, PGBSET
- 13: PGBAP
- 14: PGBM, PGMIL

**March 1962**
- 6: PGB, PGMIL
- 7: PGB, PGBSET
- 13: PGBAP

**April 1962**
- 3: PGB, PGMIL
- 4: PGB, PGBSET
- 11: PGB

**May 1962**
- 1: PGB, PGBSET
- 2: PGB
- 8: PGBAP, PGMIL
- 9: PGBAP, PGMIL

**June 1962**
- 5: PGMIL
- 6: PGB
- 13: PGB
- 19: PGBSET

* Tutorial Series on recent antenna developments

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**Meeting Ahead**

**Technology al Fresco**

On Sunday, September 24, members of the East Bay Subsection with their friends and families will take to the open country for a combination picnic and technical session in the Marsh Creek Springs Park (see map). Other details including reservation information are included in the Calendar.

Attendees are to take their own lunches and assemble at noon. Beverages will be provided. The park does, however, have a cafe in addition to facilities for swimming, games, and short hikes.

New officers of the Subsection will be in charge of the proceedings. They are as follows:
- Chairman: E. A. Aas, Sandia Corporation, Livermore.
- Vice Chairman: John Lavrischeff, LRL, Livermore.
- Secretary-Treasurer: Ted Hamm, LRL, Livermore.

Arrangements: Bert Kortegaard, LRL, Berkeley; and Gordon Longerbeam, LRL, Livermore.

Publicity: Sid Yakowitz, LRL, Berkeley.

Program: Robert Roulette, LRL, Livermore; and Carl Furrhberg, Sandia Corporation, Livermore.

Membership: Tom Nugent, LRL, Livermore.

Reporter: Jim Wright, Sandia Corporation, Livermore.

(Continued on page 8)
Lecture series in plasma physics, environmental engineering, and space sciences will be offered this fall by University of California Extension.

"Plasma Physics in Theory and Application" is a series of 16 lectures to be presented at Moffett Field beginning the week of September 25. The series is designed as a comprehensive introduction to the new field for research workers and others desiring a general knowledge of plasma physics.

"Environmental Engineering," a series of 16 lectures, will begin the week of September 4 in Palo Alto. Enrollment is open to research workers, designers, engineers, technicians, and management concerned with reliability and product assurance.

"Space Sciences" is another 16-lecture series which begins the week of September 18 in Palo Alto.

Further information about the lecture series and application for enrollment may be obtained from the Department of Engineering and Sciences, University Extension, University of California, Berkeley 4, California.

**meeting ahead**

**OCTOBER SOUND**

For the October joint meeting between PGA and SMPTE listed in the Calendar, the speaker will be Michael Rettinger, RCA. He will speak on two subjects: a directional microphone, and the acoustics of a sound studio.

Rettinger has been with the RCA engineering department in Hollywood for 25 years. He is a well known consultant in acoustics, particularly studio acoustics, and has an extensive background in development engineering on microphones, loudspeakers, head-phones, and magnetic heads. He has an MS in physics from UCLA (1933), and is a Fellow of the SMPTE, a Member of the Acoustical Society of America, and a Member of the AES. He is the author of two books and many papers in the audio engineering field, and has been granted 20 patents.

**new publication**

**SECTION DIRECTORY**

Because of a shortage of space in the Grid, the usual Directory of Section Officers is not being printed in this issue. Instead, a separate Directory will be distributed during the month of September by the Section Officer. If you have need for this information and do not receive a copy, you may request it from the IRE Office, 701 Welch Road, Palo Alto; DA 3-1332.
Last year, Tektronix Field Engineers traveled nearly 1,000,000 miles to call upon over 25,000 precision-measurement-minded people—whom they talked with personally. Most of these people owned Tektronix equipment. Most of these calls concerned continuing assistance—1 in seeking additional training in oscilloscope theory; 2 in learning simplified techniques for present applications; 3 in planning new applications for present equipment; 4 in installing factory modifications in older instruments; 5 in ordering additional equipment for their laboratory.

This personal touch in providing continuing assistance to users of Tektronix equipment characterizes the Field Engineer.

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Your Field Engineer provides continuing assistance in helping you maintain your Tektronix oscilloscopes and auxiliary equipment to the fullest degree of their capabilities.

For example, when you send your instruments to Tektronix on a periodic maintenance program—as many companies do—your Field Engineer schedules the work thru one of 20 Tektronix Repair Centers.

At these fully-equipped facilities, located throughout the United States and Canada, experienced Tektronix Field Maintenance Engineers perform precisely the instrument-maintenance work requested.

Or, perhaps your own instrument-maintenance technicians handle test and calibration of your Tektronix equipment. For them your Field Engineer will willingly conduct classes in preventive-maintenance procedures. These informal classes covering time-saving trouble-shooting techniques can be held at your convenience—at a Tektronix Field Office when feasible or at your own company location.

Regardless of your instrument-maintenance need, call your Tektronix Field Engineer. He expects to hear from you—for your selection of Tektronix instruments entitles you to continuing assistance in maintaining those instruments to their fullest capabilities.

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Two of many instrument-maintenance services available at Tektronix Repair Centers.
**Wescon Report**

**Bull Run**

As anticipated, not a single real cow was to be found on the premises of Wescon 1961—though the San Francisco Cow Palace abounded with salesmen of various kinds touting electronic materials, components, systems, and services from the record-breaking 1180 booth spaces and elsewhere. There were 31,349 listeners. Competition seemed more apparent and sales efforts generated perhaps a new high in novelties like recordings of space signals, balloons with internally orbiting poker chips, blinking plastic eyes, and the like.

**Technical Program**

Papers-sessions participants gathered in convenient groups for the benefit of the press and sketched in the outlines of their individual presentations.

Arthur E. Lilley, associate professor of astronomy at Harvard, spoke about the instrumentation dilemma on Venus which seems to impale investigators with the question of whether the planet has at its surface the optically measured temperature of 300 K or the radiospectroscopically measured 600 K. If the former, then the 600 K reading comes from ionospheric activity, and probes have either the problem of developing instrumentation capable of operating in a broiling 600-K ambient, or being able to work in a reasonable 300 K, transmitting intelligence through the 600-K ionosphere.

R. W. Boom, Oak Ridge National Laboratory, described work conducted at 1.5 K toward the reduction of size in magnet solenoids using wire of niobium compounds. Arnold Addison, associate professor of engineering research and personnel director at Pennsylvania State University, discussed a program under study at that institution for the systematic evaluation of engineering and scientific personnel and based on the idea of the employee and his supervisor both completing evaluation forms prior to a series of interviews between the two, and between the supervisor and the assistant director—the upshot of the latter being fed back to the employee. Ronald R. Segel of Daniel, Mann, Johnson & Mendenhall, expressed the user's viewpoint of the encoding, abstracting, storage, and retrieval problems in the handling of data by anyone engaged in activities involving original concepts.

Lester C. Van Anta, former special assistant for arms control in the Office of the Director of Defense Research and Engineering and now technical director of the Hughes Research Laboratories, moderated a special evening session covering the technical aspects of arms control, and featuring Dr. W. H. K. Panofsky, professor of physics at Stanford and deputy director of Project M; Rear Admiral P. L. Dudley, special assistant to the joint Chiefs of Staff for disarmament affairs; Morton Halperin, Harvard Center for International Affairs and Rand Corporation, Dr. Donald G. Brennan, Lincoln Laboratories, MIT; and Dr. Charles E. Osgood, director of the Institute of Communications Research, University of Illinois.

This meeting produced a broad-spectrum outline of the technical aspects of the problems and one proposed solution—a plan called GRIT (Graduated Reduction of International Tension) proposed by Dr. Osgood. Under this scheme, the United States would launch and follow through on a program of specific moves calculated and pre-announced as aimed at the objective of diminishing world tension. As an experimental psychologist, he expressed conviction that this would both generate corresponding counter-moves by Russian strategists and produce an enhanced international image for the United States.

**Administration**

**Proposed Change in Bylaws**

At the meeting of May 22, 1961, the executive committee adopted a recommendation that the following change in the Section bylaws be made:

"Delete sentence two of Article X. Substitute following sentence: "Any amendments to these Bylaws shall require a two-thirds vote of the voting members present at a regular executive committee meeting, provided that notice has been given to all voting members of the Section at least three weeks prior to such meeting."

In accordance with the present bylaws, notice is hereby given to the voting members of the Section. A vote on this proposed change will be taken at the next Section meeting.
Complete VERSATILITY...Audio, Video, VHF

KAY Ligna-Sweep SKV®
All-Electronic SWEEPING OSCILLATOR
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50 cps to 220 mc. in 12 bands • Wide range of sweep widths
Variable rep rates • Manual and automatic operation

- Single wide-sweep video displays from 10 mc down to 1 kc.
- Linear and logarithmic sweeps of 0.2 cps to 30 cps; or sweep locked to line frequency.
- Audio sweep of 50 cps to 20,000 cps.
- 8 fixed, narrow-band video frequency sweeps for repetitive operations.
- Fundamental frequency 10 mc to 220 mc (widths to 30 mc plus).
- High-level output of 1 V rms into 70 ohms. AGC'd to ±0.5 db over widest sweep.
- Manually-operated control for varying oscillator frequency.
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Price: $1295.00 F.O.B., Factory ($1425.00 F.A.S., New York).

The wide frequency range, extensive choice of sweep widths and repetition rates makes the Kay Ligna-Sweep SKV a most useful sweeping oscillator.

For high frequency work, the unit provides 9 sweep bands, operating at fundamental frequencies for wide, stable sweeps from 10 to 220 mc. At the low end of the spectrum, an audio frequency sweep from 50 to 20,000 cps is provided. High order stability permits frequency sweeps to as low as 50 cps.

For checking high-Q circuits and low-frequency response characteristics, either log or linear sweeps at variable rep rates down to 0.2 cps are available. This wide choice of sweep rates (continuous to 30 cycles, and fixed line lock) makes it easy to select that highest rep rate which gives both an accurate response display and easiest, brightest viewing on the scope screen. With the manual frequency control, the trace on the scope screen may be held and examined in detail, (counted precisely, measured on a VTVM) at any frequency point on the scope display.
MORE WESCON

with the new signal is included one San Francisco transmitter—that of KPEN. James E. Hacke, Jr. talked about the best arrangements for microwave satellite communication which could provide under-developed countries with appropriate facilities at reasonable cost and concluded that ten or so active equatorial satellites offer the best solution. Eric S. Gutmann of Gilfillan Bros., Inc., gave details on a new airborne display for a computer-controlled map which furnishes a pilot with continuous all-weather information on his present position and heading. Equipment, weighing approximately 28 pounds and costing $5,000 to $8,000, has a three-mile accuracy.

Samuel G. Lutz, senior scientist at the Hughes Research Laboratories, discussed the relative advantages of a stationary-satellite system for point-to-point communications. Lutz concluded that this system offered the best possibilities through better communications and wider use of the spectrum by frequency sharing. Transmission delays encountered by the distance involved in this type of orbit present a serious problem.

Bernard M. Oliver, director of research at Hewlett-Packard, in a discussion of the potentialities of the optical maser, listed many uses for the high-density beam available, but feels that the most profound uses are yet to be imagined.

Paul P. Kisliuk, Bell Telephone Labs., described experiments using a pulsed-ruby maser as a light amplifier. Gain factors of two were observed using a ruby maser oscillator as a source.


Hughes Aircraft Co., spoke about a research program under way at the laboratory concerning the use of a ruby laser as a ranging device. With an experimental model, accurate measurements of ranges up to about seven miles were obtained.

Future Engineers

One young scientist carried away both the Frederick Emmons Terman Award of $250 and the Lee de Forest Award of a $1,000 scholarship to a college of choice. This clean sweep was accomplished by Douglas B. Bingham from Castle Rock, Washington, who showed a sequence-controlled-relay digital computer and presented a paper on the same general topic. Second place was won by Dennis M. Taylor of San Jose, and third place by Robert Burke of Whittier.

Industrial Design

Five awards of excellence were presented to designers and their organizations selected from among the 23 awards of merit previously announced. These included Hewlett-Packard Company for an instrumentation packaging system, Tektronix, Inc. for an oscilloscope case, Precision Instruments Co. for a recorder/ reproducer, Collins Radio Company for an oscillograph and a microphone housing, and Amana Refrigeration for the best instrument packaging system.
Now, with one instrument, you can instantly measure 1 mv at 1,000 mc!

or any rf voltage 1 mv to 10 v, from 500 KC to 1,000 MC.

Measuring is as simple as “touch and read;” resolution is high, thermal drift errors are virtually eliminated!

Now, easily and dependably and with utmost accuracy, you can measure millivolts at rf frequencies — and on one simple-to-use instrument, 411A Voltmeter. This remarkable instrument has true linear operation (no correcting networks) and readings are presented on a large, mirror-backed linear meter. Temperature stability is such that there is virtually no change from 10° to 40° C.

Specifications alongside indicate basic features of this important new, time-saving instrument. Other special features include (a) matched diodes protected against burnout (b) probe temperature compensated for low drift (c) Amplifier photocell eliminating contact noise, guaranteeing high sensitivity and zero-drift freedom (d) extra probe tips available including a 500 KC to 250 MC tip; 100:1 Capacity Divider tip, and Type N Tee tip for coax use to 1,000 MC.

Why tolerate a complex, cumbersome voltmeter. Get a new 411A into action on your bench now!

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CONTACT OUR ENGINEERING REPRESENTATIVES, NEELY ENTERPRISES, FOR INFORMATION — Los Angeles, 3930 Lookout Blvd., North H. w., 92
71-2289 and 6-3811; San Carlos, 501 Laurel St., Lym-2-626; Sacramento, 1217 Fifteenth St., GI 2-901; San Diego, 1555 Shaffer St., AC 3-8166; Phoenix, 641 E. Missouri Ave., C8 4-5431; Tucson, 222 So. Tucson Blvd., MA 2-2544, Albuquerque, 6501 Lomas Blvd., N.E., 255-8586; Las Cruces, 114 S. Water St., 526-2486.
Bill Hewlett, Hewlett-Packard Co., comes away with one of the Awards of Excellence in the Industrial Design Competition. Hank Brown, Wescon executive committee chairman, prepares to present the next award while J. W. Stringer, committee vice chairman, looks on.

MORE WESCO

dia for an f-m transmitter, and Kaar Engineering Corp. to a portable transceiver.

Social Events

Social events included the bigger and better cocktail party held this year for the first time in the new Grand Ballroom of the Fairmont Hotel. As the computations worked out, the space of 17,856 square feet was enough less than the 19,500 utilized in 1959 that the share for each vertical person of the 3000 expected was reduced from 8.12 to 7.44 sq ft, a drop of 0.68 sq ft which required each party-goer to stand approximately four inches closer to his neighbor than heretofore. Nobody seemed to mind.

WEMA held its traditional luncheon with Dr. Arnold O. Beckman of Beckman Instruments Inc. as principal speaker and also recipient of the Western Electronic Medal of Achievement for significant contributions to the advancement of electronics in the West. Beckman entered a plea for better management, higher profits, abandonment of the luxury of mediocrity, and a return to the philosophy of “first placement.”

This year the traditional Wescon luncheon yielded to a new all-industry banquet and dance. Principal speaker was Lloyd V. Berkner, president of the Institute, chairman of the space-science board of the National Academy of Science, and president of the Graduate Research Center of the Southwest in Dallas.

Speaking on “IRE and the Universe,” he looked at space from the three aspects of science, application, and exploration, and regarding exploration he felt that economically, through commercial and meteorological applications, our program will pay for itself in 50 years. In the communications aspect of the program, he attempted to set the minds of apprehensive astronomers at rest by pointing out that the U.S. is taking great care to be sure that Project West Fort will result in no damage to astronomy or any other scientific activity.

As to putting a man on the moon, he felt that we will not be ready in 1964, a year of minimum sun spots, and doubts that Russia will be ready either. Maximum sun spots make 1970 an unfavorable year from the viewpoint of required shielding, but by 1975 he expects excursions of many men to have reached the moon.

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Chicago Aerial Industries’ electronic blade tracker does the critical job of tracking helicopter blade rotation. Because rigid standards of reliability are mandatory, Chicago Aerial selected Tung-Sol tubes to handle vital regulation.

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Tapes of “Mylar” also resist stretching and breaking from sudden stops and starts, edge nicks, and are unaffected by humid storage and aging. They have 7 times the initial tear strength of ordinary plastic tapes!

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(Continued on page 18)
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Power Supplies are portable, too

Talk about small size, this portable Electronic Measurements Power Supply measures just 7½" W x 5½" H x 6½" D. Yet it has all the features of much larger E/M Semiconductor Power Supplies . . . vernier as well as main voltage control, continuous current limiting control, remote programming, 0.1% regulation, and more.

Ask for Catalog 1961-1.

BRIEF SPECIFICATIONS

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Opportunities in Basic Research or Development in the fields of ELECTROMAGNETIC THEORY & ANTENNAS

Requirements of new and continuing projects concerned with space vehicle communications, navigation, and radar have created new openings for electromagnetic theory specialists as well as antenna engineers. The scientists and engineers of the Research and Development Division of the Hughes Aircraft Company Aerospace Group in Culver City are providing broad scientific and technical leadership to government and company funded programs on advanced airborne and space electronic systems, air to air missiles, ballistic missiles, and satellite and interplanetary communication systems. As part of this team, the Antenna Department is responsible for a diversified program of antenna research and development in the following specific areas:

1. Advanced techniques for space communication and navigation.
2. Information theory and data processing applied to antenna systems.
4. Pattern synthesis from sources on arbitrarily curved surfaces.
5. Aperture control by application of solid state devices.
6. Multi-function aperture and feed capabilities.

Immediate assignments exist for scientists and engineers of superior ability who meet the qualifications in one of the following categories:

RESEARCH □ Advanced degrees and experience in electromagnetic theory □ Interest in fundamental research in antennas, wave propagation, scattering theory, plasma effects on electromagnetic radiation, and solid state antennas.

DEVELOPMENT □ Graduates in E.E. or Physics or extensive experience in lieu of degree.
□ Minimum of three years of professional experience in monopulse and conical lobing antennas in reflector and array configurations, electronically scanned arrays, inflatable and erectable antennas, shaped beam arrays from curved surfaces and signal processing antenna systems.

If you meet the above qualifications and are interested in joining other superior scientists and engineers at Hughes, please airmail your resume to MR. ROBERT A. MARTIN, Supervisor Scientific Employment, Hughes Aerospace Engineering Division, 11940 West Jefferson Blvd., Culver City 80, California.

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MORE PGPEP

The topic for the evening was "Application of Electron Beams in Electronic Fabrication Processes." This field, which has been under development for many years, is an offspring of the electron microscope. Though the principles have been known and applied for a long period of time, the method is now moving into the production stage. The cost of the operation still prevents widespread use since a basic electron-beam machine costs as much as $75,000 and by the time accessories and installation have been added, figures are in the six digit area.

An electron-beam machine operates at high voltage and low current ranging from 30,000 to 150,000 volts and 50 to 250 ma. With the aid of charts, Vance demonstrated the influence of electronic characteristics on successful welding and machining. After the foundation for the continued presentation was laid, Vance described different types of electron-beam guns and machines. These operate under high vacuum which necessitates the use of mechanical vacuum pumps as well as oil booster pumps. The material to process rests on a remote controlled turntable inside a vacuum chamber that also houses the gun. The material may be welded, cut, or machined with the highest precision. As an example, Vance mentioned drilling of sapphire jewels for watches. Such precise drilling is done in seconds and large quantities of small parts may be on the turntable simultaneously.

The presentation was followed by an interesting discussion.

—OLOF LANDECK

meeting review

COOL COMMUNICATIONS

Mr. Robert W. DeGrasse of Microwave Electronic Corporation gave an interesting description of the receiving equipment for Bell Telephone Laboratories' Project Echo to the May 24th meeting of the PGMTT at Stanford. In this satellite communication experiment, contact was successfully established between stations in California and New Jersey, using different carrier frequencies (960 mc and 2390 mc) for transmission in the two directions. These carriers were frequency modulated with a 5-kc audio band-width and up to 200-kc frequency deviation. DeGrasse's group developed the receiving equipment for the higher frequency, consisting of two maser amplifiers (one for each direction of polarization) and an S-band horn antenna.

Amplification in the masers takes place in suitably doped ruby material, cooled to liquid-helium temperatures and magnetized with a field of 2530 oersteds, which produces resonance of the electron spins at the carrier frequency (2390 mc). The ruby is in the form of a number of rods placed in a comb-type slow-wave structure. This structure is also loaded with alunina and yttrium iron garnet. The alumina loading makes possible a very narrow bandwidth. The garnet material is placed in the same magnetic field as the ruby, so that its ferrimagnetic resonance occurs at the same carrier frequency. It can thus be used to produce strong non-reciprocal attenuation, which greatly enhances the stability of the amplifier. Gain of 35 db was obtained over a 17-mc bandwidth. Pump power of 70 mw per channel was supplied at a frequency of 13 kmc. The maser noise temperature was 8 K.

The horn antenna used in conjunction with the masers has a gain of 40 db and side lobes more than 60 db below the isotropic level. When the antenna is pointed in the vertical direction the overall system temperature is 17½ K. This includes 8 deg from the maser, 2½ deg from the sky and the remainder side lobe pickup from surrounding objects. When the antenna is pointed near the horizon, the noise figure rises to 150 K.

—E. F. BARNETT

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new product capsule

advertisements

ZERO-BIAS TRIODES

New line of compact power triodes is available for use as zero-bias Class-B linear amplifiers in audio or r-f applications. The first high-power zero-bias triodes ever produced, they will permit elimination of the bias power supply to simplify transmitter circuit designs.

Typical power gains of twenty times are realized in grounded-grid circuits. Small size makes the tubes suitable for use in compact, single-sideband communications equipment.

Peak-envelope powers range from 500 to 20,000 watts. Tubes include the glass-and-metal 3-400Z, 3-1000Z and 3X300OF7 versions and the ceramic metal 3CX10, 000A7 and 3CV20, 000A tube types.

Eitel-McCullough, Inc., San Carlos, Calif.
grid swings
IT IS REPORTED:

Hansen  Britt

Major personnel changes for Tech-Ser, Inc., have been announced by Jack C. Guy, president Howard M. Hansen, formerly manager of the Palo Alto office, has been appointed vice-president and general manager. Cecil W. Britt, Jr., has been promoted to manager of the Palo Alto office, 640 Donahoe Street. Jack R. Penwell, formerly with Philco Corp., replaces Britt as instrument engineer in Palo Alto.

William H. Heflin has been appointed to the newly created position of vice-president and general manager of Fisher Research Laboratory, Inc., Palo Alto; Herbert K. Krengel has been elected vice-president of marketing and director of Lenkurt Electric Co.; Louis Martin has been appointed director of marketing at Eitel-McCullough, Inc.; David A. McGibbon has joined Lenkurt Electric Co. as an engineer in the company's microwave project group; Arthur Vassiliadis has joined Kane Engineering Laboratories as senior electrical engineer. Royal Weller has been named to the newly created position of director of engineering for the space systems division of Lockheed Missiles and Space Co.; Charles A. M. Prior and Robert E. Wolfe have been appointed manager of engineering services and manager of production at Melabs; Rudolph Furrier has joined Lockheed Missiles and Space Co. as special assistant—reliability. At the radiation division of Varian Associates the following managerial appointments have been made—Ray Kent, microwave systems; John Moore, microwave equipment; Gery Logan, microwave components; and James Halcomb, military magnetics; William D. Collins, Jr. has been appointed manager of the San Francisco district office of Radiation Incorporated located at the company's subsidiary Radiation at Stanford; Gordon L. Ness has been named instrumentation marketing manager for Fairchild Semiconductor; Nathan W. Snyder has joined Royal Research Corp. of Hayward as vice-president and director of research and engineering.

(Continued on page 20)
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MORE SWINGS
Beckman & Whitley, has named John W. Badnau as sales manager, and has
also directed several other organizational responsibilities into a vertical
rather than horizontal pattern. Myron B. Baldwin becomes vice president of
marketing, Joseph R. Greer, becomes vice-president of operations, and Thom-
as E. Holland becomes vice president of research and engineering.

Gottfried
Hennings

Two new managers, William C. Hen-
nings and Hugh L. Gottfried, have been
appointed to head recently established
branches of Melabs. Hennings has been
appointed manager of the company’s
new space systems branch. Gottfried is
named manager of the new reconnaiss-
sance systems branch.

William W. Eitel
Fellow IRE, 1955;
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tion of the Institute of Radio Engineers own and
publish their own Section and Professional Group
activities monthly, the Grid. Its advertising pages
reach these scientists and engineers on the com-
mon ground of their own professional activities.
The San Francisco Section, IRE, is the profes-
sional-electronic voice of the area surrounding
the fabulous San Francisco Peninsula, the birth-
place of electronics—the spot where de Forest’s
development of the first amplifier and the first
oscillator took place. Electronic pioneering is still
going on here within the 200 plus electronic re-
search, development, and production companies
in the area.
Be sure this group knows about your products or
recruitment activities.
At Fairchild Semiconductor Corporation, Donald B. Rogers, formerly sales manager for Fairchild's diode facility in San Rafael, has been named to the position of field sales manager. Succeeding Rogers as diode sales manager is John F. Ready. Ready moves to this position from central regional sales manager, Chicago. Robert F. Graham has been appointed to the new position of special products and Micrologic sales manager. Graham comes to this position from that of western regional sales manager, Los Angeles. He will be succeeded in that position by Alan J. Baley, former district sales manager in Palo Alto. Robert W. Dugan comes to the position of transistor sales manager from eastern regional sales manager, Garden City, L.I., New York.

Dr. J. Richard Hechtel has joined the staff of the research laboratory of Litton Industries' electron tube division as a senior scientist. For the last three years Hechtel has been head of the microwave tube branch of the Naval Ordnance Test Station, China Lake. Previously, he was employed for seven years as research scientist and head of the microwave tube department for Telefunken, GmbH, at Ulm, Germany.

(Continued on page 22)

MORE SWINGS

Dr. I. J. Teff, manager of Telefunken, the German microwave division, has succeeded Peter Chenoweth as general manager of the firm's production department in Los Angeles. Also recently appointed as assistant manager in the microwave division is Rafael M. Nowak.

TRAN-S-AIRE BLOWERS

Ideal for use where excessive heat is generated by equipment in an enclosed rack, cabinet or console. They draw in fresh air or exhaust heated air. These blowers occupy less area, and a smaller panel space than others having similar air displacement capability. They are the lowest priced units of equal capacity and performance. Available in three sizes with air displacement from 100 cfm to 700 cfm.

SHADOW CABINETS

An extremely versatile housing since both front and rear panels as well as bottom may be removed for installation or servicing purposes. Unusually attractive appearance is created by recessing the front panel one inch as well as by beveling the front. The two piece body is made of 18 gauge steel and the panels of 16 gauge steel. Four sizes available. Finished in light gray hammertone.

CREATE THE IDEAL ENVIRONMENT FOR YOUR ELECTRONIC EQUIPMENT WITH THESE BUD PRODUCTS

COWL-TYPE MINIBOXES

Bud Cowl-Type Miniboxes have a projecting cover which reduces glare from overhead lighting. It also provides protection for controls and dials. Cover has two box braces to which the bottom is attached by means of sheet metal screws. When assembled, this type of construction results in a sturdy, rigid housing. The unit may be table mounted or hung from a wall. Fabricated of .040 aluminum and furnished natural or with light gray hammertone finish. Four sizes available.

CONTOUR UTILITY CABINETS

A very practical housing with symmetry and strength. Rounded contour corners as well as the flanged panels combine to preserve the eye-catching design. Fabricated from 20 gauge steel to provide strength and rigidity. Front and rear panels are removable, the front panel being solid while the rear panel is louvered to provide ventilation. Body is finished in smooth dark gray enamel and the panels in light gray enamel. Six sizes available.

See these new Bud Products at your Authorized Bud Distributor or write us for literature.

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Woodland Hills, California

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—for exceptionally high performance... a full range of sizes... 30-day deliveries

D-B supplies ferrite isolators covering a range from 2.6 to 18.9 kmc. Units will soon be available to 140 kmc. All units in the line have the following high-performance features:

High isolation—a minimum of 30 db at X Band, and 24 db at Ku Band.
Low insertion loss—a maximum of 1.0 db in ALL sizes.

DeMornay-Bonardi isolators are resonance absorption type units, employing a low-loss ferrite developed especially for this application.

Low VSWR—a maximum of 1.15 in either direction.
Short insertion lengths—only 6½" in X Band size.
Complete data in Bulletin DB-180.

DE MORNAY-BONARDI
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MORE SWINGS

Louis D. Stevens has been given a new assignment as manager of information storage and retrieval for International Business Machines Corp.'s advanced systems development division. He joined IBM in August 1949 after receiving his MS degree in electrical engineering from the University of California.

Appointment of Lawrence Nadel as director of the systems program office for the western development laboratories of Philco Corporation has been announced. Prior to joining Philco, Nadel was assistant division manager of Aeronautical General Corporation, Azusa, Calif.

Four promotions in the data processing systems division of Smith-Corona Marchant Inc., Oakland, have been announced. Harry R. Kattelmann and Stanley R. Olson have been named senior project engineers. Both were formerly project engineers. Herbert P. Stickel has been moved up from senior engineer to project engineer and Ronald N. Borelli has been promoted to senior engineer. All four were with the SCM data processing systems division prior to its formation in October 1959, when it was the research unit of Marchant Calculators, Inc., which itself is now a division of Smith-Corona Marchant Inc.

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Drop in for a free ABACUS and learn about the opportunities for career advancement with our many client firms on both the West and East Coast.

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September 1961
MORE SWINGS

Three Bay Area firms have been approved for membership in the San Francisco Council of the Western Electronic Manufacturers Association (WEMA): E-H Research Laboratories, Inc., 163 Adeline Street, Oakland; Hill Magnetic Products, 1055 O'Brien Dr., Menlo Park; and Wiltron Co., 717 Loma Verde Ave., Palo Alto.

Lee M. Hester has joined the engineering staff at Lynch Communication Systems Inc. Before going to Lynch, Hester was with the Lockheed missiles and space division, and prior to that was with the Bechtel Corporation.

Representatives

Among recent manufacturers representative appointments are the following: Neely Enterprises to distribute Dage Division closed-circuit television equipment for Thompson Ramo Wooldridge; O'Halloran Associates will service the Erie Pacific line of digital counting, timing, and control systems; J. T. Hill will represent Power Sources, Inc. solid-state power-conversion devices; R. W. Thompson and Associates, of Palo Alto will handle Stoddart Aircraft Radio Co. for northern California; White and Company will represent The Eckel Corp; Ault Associates of Menlo Park, Solatron; and McCarthy Associates, the Carad Corporation, high-voltage equipment and instruments.

SPACE COMMUNICATION ANTENNAS

Andrew Type 52050A telemetry antenna system is a step forward in the design approach of antennas used for maintaining reliable contact between missile (or satellite) and ground installations. The BIFILAR* quad helix array consists of 4 BIFILAR helices on individual ground screens, oriented to provide optimum radiation patterns for the 215-265 mc telemetry band.

Gain is 19.3 db and beam width 16.5 degrees at 240 mc. VSWR is less than 1.8:1 across the 215-265 mc band. Polarization is right hand circular.

OTHER ANDREW GROUND TO AIR ANTENNAS

PARABOLIC ANTENNAS

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<td>H19110A-11</td>
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DISCONE ANTENNAS

Six models of this unity gain omnidirectional antenna are available for complete coverage of the 25-1500 mc range.

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Andrew Corporation
941 E. Maryland Ave. • Claremont, Calif., U.S.A.
Paul H. Robbins, speaker at the CSPE joint meeting. Section members will find Robbins’ talk on Engineering Unity a natural sequel to the Siegman Report.

Sept. 21—Joint meeting of the Northern California Chapters of the California Society of Professional Engineers.

**Events of Interest**

**IRE MEETINGS SUMMARY**


Oct. 6-7—Eleventh Annual Broadcast Symposium. Willard Hotel, Washington, D.C.

**IRE PAPERS CALLS**

Oct 1—Title of paper and author’s name for 1962 Southwestern IRE Conference (Houston, Texas, April 11-13). Send to: Prof. Martin Graham, Rice University, Computer Project, Houston 1, Texas.


Nov. 10—Three copies of complete preliminary draft for the Spring Joint Computer Conference (San Francisco, May 1-3, 1962). Send to: Richard I. Tanaka, Lockheed Missiles and Space Co. research branch, 3251 Hanover St., Palo Alto.

Meeting will commence at 7:00 p.m. (social hour 6:00-7:00) in the Skyline Suite of the Hilton Inn at the San Francisco International Airport. The guest speaker will be Paul H. Robbins, executive director of the National Society of Professional Engineers, who will discuss “A Step Toward Engineering Unity.” The Peninsula Chapter is serving as host and extends an invitation for members of the San Francisco Section to attend the meeting and participate in the discussion. For reservations (including dinner) contact: K. W. Henderson, 1914 Cooley Ave., Apt. 5, E. Palo Alto, 6-2440.
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Especially useful for checking accuracy of laboratory voltmeters and oscillographs

Ballantine's Model 420 Calibrator has proven to be an extremely useful instrument for quickly checking the calibration accuracy of voltmeters and oscillographs.

Its long term stability is such that you can rely on it for better than 1/4% when using it with a calibration chart, and 1/8% without the chart. Accuracy checks can be made with it in less than a minute. This will help you to reduce materially the out-of-service time for voltmeters that otherwise might have to be sent to a central calibration department.

**BALLANTINE MODEL 420 - AC-DC CALIBRATOR**

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Internal Impedance of Outputs: 2 to 20 ohms over range 0 to 10 v, 1000 cps output; less than 5000 ohms on dc output.

Distortion and Hum: Less than 0.25%.

Setting Resolution: Approaches 0.01% above 10 mv.

Power Supply: 115 v, 50-60 cps, 35 watts; 230 v, 50-60 cps on request.

Dimensions: 6" h, 6 3/4" w, 10 7/8" d.

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