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

December, 1962 (mid-month):
Cover: shown are the 15 IRE award winners from our Section – more than for any other Section in the IRE. John Moll is elected a Fellow of the IRE; he joined Stanford from Bell Labs. When I was studying semiconductors, we used a preprint of his book, which featured the Ebers-Moll model of the transistor. He went on to Fairchild, then Hewlett Packard, and then received the IEEE’s Edison Medal in 1991.

Page 8: Fred Terman of Stanford (see cover) has won the IRE’s Founders Award, which is given only on special occasions; the citation is for “distinguished leadership in the organization and administration of, and contributions to, scientific research and education.” Only 6 have been given. He chaired the IRE in 1939, headed up the wartime Radio Research Laboratory at Harvard, and developed Stanford’s EE department into the nation’s largest producer of doctoral graduates. He (and Stanford president Wally Sterling) started the Stanford Industrial Park, now with 40 tenants. An article about him is in the December 1962 Readers Digest.

Page 8: The Bio-Medical Electronics chapter lays out the agreements in principle for merging with the AIEE’s similar chapter; the plan is to cooperate now on joint meetings/activities, and complete the integration with election of IEEE officers next summer.
Today at Hughes you will find one of the country's most active space-electronics organizations. Important new and continuing projects, including SURVEYOR, SYNCOM, Missile Defense and POLARIS guidance systems are growing at unprecedented rates.

This vigor promises the qualified engineer or scientist more and bigger opportunities for both professional and personal growth.

Many immediate openings exist. The engineers selected for these positions will be assigned to the following design tasks: the development of high power airborne radar transmitters, the design of which involves use of the most advanced components; the design of low noise radar receivers using parametric amplifiers; solid state masers and other advanced microwave components; radar data processing circuit design, including range and speed trackers, crystal filter circuitry and a variety of display circuits; high efficiency power supplies for airborne and space electronic systems; telemetering and command circuits for space vehicles, timing, control and display circuits for the Hughes COLIDAR (Coherent Light Detection and Ranging).

If you are interested and believe that you can contribute, make your appointment today.
Measure frequency and ratio directly; measure speed, rpm, pressure, temperature, acceleration or any phenomena that can be converted with transducers to ac or pulses.

The same design, circuitry and construction features of all new transistorized & counters are incorporated in this low-priced, general-purpose counter. Time base is derived from the power line, providing 0.1% accuracy—fully adequate for many frequency measurements. The counters have a maximum counting rate of 300 KC. 0.1 v sensitivity permits low-level measurements.

Model 5211A has gate times of 0.1 and 1 second. Model 5211B has an additional gate time of 10 seconds. Otherwise, the instruments are identical. A storage feature, which can be disabled by a rear-panel switch, provides a continuous display, each reading held on the 4-digit neon columnar readout until the count itself changes. The counters provide a 1-2-2-4 BCD code output for systems use or recording devices. Manual gate allows the 5211 counters to be controlled by the front panel, or be operated remotely by contact closure or suitable pulses.

Solid state design and construction provide low power consumption, low heat dissipation, operation over a wide temperature range. The counters are housed in the new & modular cabinet for bench and rack mount. Plug-in circuit modules and ready accessibility simplify maintenance. Both models weigh but 10 lbs. and can easily be carried in one hand. Conservative design features, such as the use of decade dividers in the gate generating circuits, provide operational stability and eliminate calibration problems.

Specifications

Maximum counting rate: 300 KC

Display: 4 digits, neon column

Input sensitivity: 0.1 v rms sine wave

Temperature range: 20 to 50°C

Time base: 50 or 60 cps power line

Manual gate: Controlled by front panel function switch, external contact closure, or by 3 volt peak positive pulses at least 10 μsec wide at half amplitude point.

Frequency measurement: 2 cps to 300 KC; accuracy ± 1 count, ± time base accuracy

Ratio measurement: Read as (f1/f2)

Range: f1; 2 cps to 300 KC (0.1 v rms) for 100 cps to 300 KC (1 v rms into 1000 ohms)

Accuracy: ± 1 count of f1, ± trigger error of f2

Dimensions: 10¼" wide x 3½" high x 11½" deep, 10 lbs

Price: $5211A, $750.00; $5211B, $825.

Data subject to change without notice. Prices f.o.b. factory.

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ADDRESS DEPT. TG-12

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MEETING CALENDAR

SAN FRANCISCO SECTION
(Joint meeting with PGCS and AIEE)
"Oblique Ionosphere Soundings and Radio Propagation"
Speaker: Raymond D. Egan, manager, advanced communications, Granger Associates
Place: Auditorium, Crown Zellerbach Bldg., Market and Sansome, San Francisco
Dinner: 6:00 P.M., Mirror Room, 2nd Floor, Veneto Restaurant, Mason and Bay, San Francisco
Reservations: Mrs. Doris Gould, DA 1-1332
(Parking available at restaurant and Zellerbach Bldg.)

PROFESSIONAL GROUPS
Antennas & Propagation
(Joint meeting with San Francisco Section, IRE and AIEE; see above)
"Space Research Program from the Point of View of Education"
Speaker: Professor Samuel Silver, University of California, Berkeley
Place: University of California
Dinner: Faculty Club; University of California Campus: time to be announced
Reservations: To be announced

Audio
"Noise in Recording Systems"
Speaker: Bob V. Markevitch, research division, Ampex Corporation
Place: Stanford Research Institute, Conference Room B
Dinner: 6:30 P.M., Atherton Club, 3391 El Camino Real, Atherton
Reservations: Herb Ragle, EM 9-7111, Ext. 821

Communications Systems
(Joint meeting with San Francisco Section, IRE and AIEE; see above)
"Thermo-magnetic Cooling"
Speaker: Dr. Kermit F. Cuff, research scientist, Lockheed Research Labs
Place: Physics Lecture Hall, Room 100, Stanford University
Dinner: 6:30 P.M., Red Shack, 4085 El Camino Way, Palo Alto
Reservations: None required

SAN FRANCISCO SECTION OF AIEE
Communications Division
(Joint meeting with San Francisco Section, IRE and PGCS, see above)

WESCO NEWS
1963 PAPERS CALL
A call for papers for the technical program of the 1963 Western Electronic Show and Convention has been issued by the committee headed by Dr. Jerre D. Noe, director of the Engineering Sciences Division of Stanford Research Institute.
Dr. Noe has announced April 15 as the closing date for submissions. To be furnished are three copies each of abstracts running 100 to 200 words, and summaries of from 500 to 1000 words indicating related work and new contributions. Advance clearances should be made where needed.

Submissions should note an IRE professional group classification as an indicator of the technical field into which the subject falls.
Dr. Noe has also reported that no convention record of the 1963 WESCO technical program will be published.
Vice chairman of the technical program committee is Dr. John G. Linnell, professor of electrical engineering at Stanford University.
Authors should submit abstracts and summaries as follows: Dr. Jerre D. Noe, WESCO Technical Program Chairman, Suite 2210, 701 Welch Road, Palo Alto, California.
plans for the 1963 wesc on being well under way, as you will read in other articles in this issue of grid, a final review of the 1962 event is in order.

total registration for this year’s event (46,152) was almost 6000 more than in any previous year, and well ahead of even the most optimistic predictions, largely attributed to the excellent publicity program, including the special issues of grid-bulletin and heavy coverage in metropolitan Los Angeles newspapers.

Almost 6000 of those attending were in management capacities, and 18,677 were in various engineering positions. For those exhibitors displaying production devices, almost 3300 attendees were primarily interested in this field.

More than 85 percent of the entire registration came from the eleven Western states making up the seventh region of IRE, while 65 percent of the exhibitors came from states other than these eleven, showing the strong national interest in displaying products and developments to the Western electronics industry.

In the important field of technical papers, the preprint experiment, with two successful years behind it, has proved to be worthwhile, and will undoubtedly be continued. Copies of either 1961 or 1962 papers may be obtained by writing directly to Western Periodicals Co., 1300 Raymer Street, North Hollywood, Calif. This firm has also printed a permuted index to all WESCOn papers available for the period 1957 through 1962.

A total of 31 students participated in the 1962 Future Engineers Show and Symposium. Extremely rewarding letters have been received by the committee from these students, expressing their very successful experiences with the entire week of activities. Five students shared in the $2800 scholarship funds offered the entrants.

for the first time, WESCOn made awards for outstanding company displays, in a program to raise the standards for exhibits and to encourage companies to consider the various phases which make an exhibit more beneficial to visitors, as well as the company. Winners of awards were: Collins Radio Co.; Omni Spectra, Inc.; Tektronix, Inc.; Sylvania Electric; and Consolidated Electrodynamics Corp.

More than 850 companies exhibited in 1230 booths, to make this the largest exhibit of electronic products ever presented, slightly larger than the IRE Show from the standpoint of exhibit space, and unquestionably the largest trade show of any kind ever held in a city west of Chicago. The unanimous opinion of exhibitors, based on a survey conducted by the exhibits committee, made up of representatives of exhibiting companies, was that the 1962 WESCOn was the greatest in which they had ever participated, anywhere, from considerations of traffic flow, the inquiry card system, and the highly debated question of show hours. Opinion still seems to be equally divided regarding evening hours of exhibit.

A survey in depth regarding the technical sessions has been carried out for WESCOn by Facts Consolidated and will be reported on in an early issue of grid, as will be detailed plans for the 1963 event at the Cow Palace, August 20-23, as they further develop.

Meyer Leifer
section-wesc on director

1963 CHAIRMEN NAMED

Committee chairman and vice chairman for the 1963 WESCOn have been announced by John C. Chartz, Dalmo Victor Co., show director, and Meyer Leifer, Ampex Instrumentation Products Co., convention director. Section members wishing to serve on committees are requested to write or call the WESCOn office, 701 Welch Road, Suite 2210, Palo Alto, DA 1-1332, indicating the committee of their choice.

Banquet chairman and vice chairman are Cort Van Rensselaer, Hewlett-Packard Co., and William A. Melchior, Eichorn & Melchior, Inc.

Cocktail party chairman and vice chairman are Phillip L. Gundy, Technical Systems, Inc., and George Ewing, Lenkurt Electric Co.

Distributor-rep conference chairman and vice chairman are Elvin W. Feige, Elmar Electronics, and Charles N. Meyer, Meyer & Ross.

Exhibits chairman and vice chairman are Berkley J. Baker, Litton Industries, and Harry J. Lewenstein, Hewlett-Packard Co.

Facilities chairman and vice chairman are William W. Wilson, Neely Enterprises, and Henry Schroeder, Melabs.

Future Engineers Show chairman and vice chairman are Alan T. Waterman, Jr., Stanford University, and Charles H. Merritt, Ampex Corp.

Hospitality cochairmen are Donald B. Harris, Stanford Research Institute, and Albert J. Morris, Radiation at Stanford.

Industrial design chairman and vice chairman are Fred Hill, Lenkurt Electric Co., and Hugh Kennedy, Granger Associates.

Public relations chairman and vice chairman are Charles Elkind, IBM Corp., and Thomas D. Boyd, Stanford Research Institute.

(Continued on page 10)
awards and fellows

TERMAN, OTHERS HONORED

The man largely responsible for making the San Francisco Bay Area a leading international center of electronics research and industry will be awarded one of the two highest honors conferred by the IRE.

Dr. Frederick E. Terman, vice president and provost of Stanford University, will receive the IRE Founders Award at a banquet on March 27, 1963, at the Waldorf-Astoria Hotel in New York City.

The presentation will be one of the highlights of the first national meeting of the Institute of Electrical and Electronics Engineers.

Given only on special occasions for outstanding contributions to the profession, the Founders Award will be presented to Dr. Terman for "distinguished leadership in the organization and administration of, and contributions to, scientific research and education." Six others, including Dr. David Sarnoff of the Radio Corporation of America, have received the award since it was established ten years ago.

Dr. Terman was chairman of the San Francisco Section of IRE in 1939. After World War II he was one of the first to recognize the importance of educational institutions in the economic development of electronics. Largely through his efforts during and after his tenure as dean of Stanford's School of Engineering, the university has become the nation's largest producer of doctoral graduates in electronics.

His ideas are further reflected in the 400-acre Stanford Industrial Park, whose 40 tenants include some of the nation's leading electronics firms. He is featured in the current issue (December, 1962) of "Reader's Digest" in an article describing the San Francisco Bay Area's electronics development.

Dr. Terman is a fellow and a past president of the IRE and was the recipient of its other top award, the Medal of Honor, in 1950. He was decorated by the British government in 1946, and in 1948 received the highest U.S. civilian honor, the Medal for Merit, for his wartime work as head of the Radio Research Laboratory at Harvard.

meeting ahead

NOISE IN THE SYSTEMS

General recording system noise, with particular emphasis on magnetic tape, photographic, and electron beam recording systems, will be discussed at the December meeting of PGA by Bob V. Markovitch, research division, Ampex Corp.

Additive and multiplicative noises will be discussed and applied to the several systems. A concept used in photography will be introduced, expressing the capacity of a system to store information in the presence of multiplicative noise by measuring the number of distinguishable levels within the dynamic range of the film. A technique readily extended to electronic equipment and memory devices.

Bob Markovitch joined the applied research section of the Ampex research department in 1961. He specializes in theoretical analysis and the sensitometry of electron beam recording materials.

The speaker has been associated with studies on magnetic and nonmagnetic rapid access storage systems, video recording equipment for medical fluoroscopy, and related inquiries. He received the B.S.E.E. from UC, Berkeley, in 1954 and the M.S.E.E. in 1956.

consolidation notes

THE URGE TO MERGE

The first meeting of the merger committees of the San Francisco Sections of AIEE and IRE was held November 20 at the Engineers Club, San Francisco, under the cochairmanship of Robert E. Grady, AIEE, and Stanley F. Kaisel, IRE.

Attending were members of the AIEE merger committee, J. E. Barkle, J. C. Beckett, and Robert H. Miller; members of the IRE merger committee, Albert J. Morris and Peter Sherill; and Victor E. Kaste, chairman, SFS, AIEE.

Five tentative agreements in principle were arrived at:

1. A target date of July 1, 1963, for complete merger of all activities was set within the limits that financial considerations dictate.

2. An IEEE slate of officers will be proposed to the respective memberships for election to office starting July 1, 1963.

3. Whenever possible, activities which are common in function will be encouraged in order to work together informally, immediately, and to allow members to become familiar with each other's scope of activity, as the basis for a plan for the merging of each activity.

4. Most difficult problems of the merger (finances, publications) will be given maximum time for solution in order not to force an artificial decision, but this should not prevent early action in areas where common activity poses no difficulties.

5. Administering the evolved merger plan being the responsibility of new officers to be elected in May, accomplished but unsatisfactory solutions to problem areas should not be rushed into by the merger committee.

These principles of consolidation are tentative and subject to further consideration at subsequent meetings. Final detailed plans for consolidation must be reviewed and approved by the respective executive committees of AIEE and IRE.

Thirteen specific areas were covered at the first meeting and will be reviewed in detail in early issues of Grid.
meeting review

THE HAND

PGAC held its first meeting of the season in October at Stanford University. The speaker was Dr. Hans Ernst of the control system research department of IBM, San Jose, whose subject was a computer-controlled hand.

The servo-manipulated hand built by Dr. Ernst was an attempt to allow a digital computer to come into direct contact with the physical world, to sense its environment, and to react to this environment in trying to achieve certain specified goals.

The hand was allowed to perceive its environment by giving it a sense of touch consisting of several pressure-sensitive transducers mounted in many locations over the surface of the hand.

The hand was allowed to react to its environment by means of seven servo motors.

Although much time and energy was spent in perfecting the sense-of-touch transducers, only very inexpensive, low-quality motors and feedback potentiometers were used for movement. Instead of depending upon accuracy of positioning, the hand was forced to rely on its senses to determine its location, much as is done by humans.

If standard, deterministic programming had been used to program the digital computer to move the hand, the system would not have been very different from an automated machine tool. Little use would have been made of the hand's senses, and the system would hardly be "reacting" to the world at all. Rather, a heuristic type of programming was used where the course of action at any point was determined by the results of previous steps. If, in performing an assigned task, the hand encountered a situation that it did not expect, it was told to search back through its program for a similar situation and to act as it had previously. In this way the hand was given the ability to react "intelligently" to a changing environment.

The speaker presented a film showing the hand in action. It built a tower of blocks by sensing the positions of several blocks and then placing them on top of one another. In another task, it was told to place blocks in a box. After finding the box, it searched... (Continued on page 10)

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Regional Manager
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Gene Ward
Sales Engineer
Gene recently joined the Moxon organization after four years at MELABS where he was branch engineering manager. He has had extensive experience in microwave instruments and systems, and holds an EE degree from the University of California.

Gary Schmidt
Service and Inside Technical
A welcome addition to the San Mateo office is Gary, who joins Moxon after four years with Neely Enterprises in customer and field service. In addition to acting as application engineer Gary will also set up a local service department.

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december 13, 1962
meeting review

REMARKABLE THINKING MACHINE

Sixty members of the East Bay Subsection, their wives, and friends met at the Pleasanton Hotel in Pleasanton, November 19, for a very informative evening.

John Lavrischeff, chairman, started the speaker's portion of the evening by announcing the EBSS sponsorship of "Junior Scientists and Engineers of the East Bay." This will be a project for seniors of the various high schools, with awards for the best project or paper presented.

Cliff Proffit introduced Hyman Olken, who spoke on "The Human Nervous System as a Thinking Machine." Mr. Olken is an electronics engineer at LRL Livermore, whose hobby, since 1950, has been the study of the human nervous system. He outlined the main features of the nervous system anatomy and explained a theory he has evolved on how these features accomplish mental functions. Significance of theories of brain function for new developments in communication engineering, such as random networks and neuristors, was pointed out.

Mr. Olken showed slides of an engineer's view of anatomy, illustrating trunk lines from various control zones to the brain. The building blocks for these trunk lines are the individual...

MORE WESCON

Registration chairman and vice chairman are Fred J. MacKenzie, Stanford Research Institute, and Thomas A. Christiansen, Hewlett-Packard Co.

Technical program chairman and vice chairman are Jerre D. Noe, Stanford Research Institute, and John G. Linvill, Stanford University.

Technical tours chairman and vice chairman are Robert E. Miller, Stanford University, and John W. Summers, Varian Associates.

Visitors services chairman and vice chairman are Norman Hiestand, Varian Associates, and William C. Weber, Jr., Comap Corp.

Women's activities chairman and vice chairman are Mrs. William P. Doolittle and Mrs. Stanley F. Keisel.

Only women may volunteer for the last committee named, according to Director Leifer. All letters from those wishing to serve should be addressed to the WESCON-IRE office.

nerve cells, and each nerve cell is composed of many axons. These building blocks are of three types: transmitter, relay, and effector.

The speaker pointed out how these are organized in the body. Some respond to temperature, some to pressure. Responses of these cells are in the millisecond range.

We can achieve a model of the functional organization of the nervous system that adheres closely to the system's known anatomical structure if we postulate these basic concepts:

First, that transmission channels in the brain are not specific and fixed, but are formed by the repetitive input of sensory signals over two-way transmission channels between the brain's central exchange—the thalamus—and various regions of the cortex.

Second, that the continuous inflow of sensory input penetrates farther and farther into the mass of the cortex by a zigzag path produced by bouncing of the input back and forth between cortical layers. In this way a sensory input can be stored at any point in the cortical mass, and a succeeding, similar input can search the entire mass until it happens upon, and thus "recalls," the originally stored engram.

(Continued on page 12)

MORE REVIEW

for the blocks and started placing them as directed. When the box was moved, it merely searched for the box again and continued. Several other very interesting examples of changing environment were demonstrated.

Dr. Ernst concluded his talk by noting several possible applications of his work. Perhaps the most intriguing of these was the use of the heuristic approach to the programming of automatic explorers of the moon. Unexpected events and communication delays that would otherwise ruin a mission might be handled with ease.

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MORE REVIEW

Third, that the supersededness of one thought by another (decision) is effect
by a joint action of the nerve cells and the blood channels between them, whereby the mass of nerve cells in which one idea is stored progressively absorbs some of the cells from the area in which the other idea is stored, until the expending nerve area of the predominant idea obliterates the nerve area of the idea that is suppressed.

This is the grand scheme or gross pattern of organization of the human nervous system as a thinking mechanism which one can surmise on the basis of its anatomy. It is only a gross picture and one that will be clarified by the detailed analysis of its major parts, which follows. But even this gross picture provided the following further insight into how the brain functions as a thinking mechanism.

The cortex is formed by intermixed concentrations of efferents, interlayer neurons, and granular cells. Hence, on the basis of the above picture, the constant massive sensory input flow to the cortex will divide into these three main output streams:

1. Those inputs which go directly to efferents. These will form an output stream only slightly delayed behind the input flow. As it reaches back down through the subcortical centers, it will form a feedback which reacts with the inputs that are causing present bodily actions, to effect a graded, smooth regulation of those actions. A practical example of this would be the smooth, continuous adjustment of the hand holding the tennis racket as one watches the ball coming over the net in a game of tennis.

2. Another main output stream would be formed by the inputs which bounced back and forth between
layers. This stream would excite many memory traces and thus produce the memory-modulated inputs which cause such mental actions as pattern recognition.  

3. A third portion of the massive input stream would excite the large granular cell masses and thus cause some cell domains to absorb others and thereby produce that outflow of new ideas which underlies all judgment and creative thought.

Naturally each of these actions will take place predominantly in the area best suited for it; that is, direct feedback will take place in the area that has high concentration of transmission cells relative to granular cells, which occurs in motor cortex.

Secondly, extensive bouncing back and forth between layers, thus causing memory recall and therefore recognition, will occur in well-layered areas, such as visual and auditory cortical areas.

Finally, conception of new ideas will occur in the area where there is a relatively large portion of granular cells and comparatively small concentration of transmission neurons. This occurs in the frontal area; hence that is where what we call "interpretive" or projection mental function is concentrated. These functionally determined structural differences between major cortical areas are strikingly evident when they are seen side by side.

N. K. LITTLE

**events of interest**


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NEW OFFICERS ELECTED

One of the West's pioneer electronics executives, Emmet G. Cameron, has been elected president of WEMA. He was among the founders 20 years ago and has been an active industrial and civic leader.

Elected vice presidents were Burgess Dempster, president, Electronic Engineering Co. of California, Santa Ana; William H. Hefflin, general manager, Beckman & Whitley, Inc., San Carlos; Orison Wade, assistant chief engineer, General Dynamics/Astronautics, San Diego; Philip E. Renshaw, chairman of the board, Tally Register Corp., Seattle; and Virden E. Scranton, assistant general manager, Motorola Semiconductor Products Division, Phoenix.

Kenneth T. Larkin, associate director of electronics research, Lockheed Missiles & Space Co., Palo Alto, was elected secretary, and Robert M. Ward, vice president, Beckman Instruments Inc., Fullerton, has been named treasurer.

E. E. Ferrey, formerly executive director of WEMA, was elected executive vice president.

GRID SWINGS

IT IS REPORTED:

E. E. (Jack) Shannahan has joined Sylvania Electronic Systems, Mountain View, as EDL personnel manager after serving with Lenkurt Electric Co. as manager of employment and training since 1956.

W. M. Hawkins, Jr., has been named sales manager of the Electronic Engineering Co., Santa Ana, responsible for all field sales activities, including supervision of EECO sales rep organizations throughout the United States, Canada, Western Europe, and Japan.

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Aircom, Inc. ........................................................ Adcom Associates
Antenna Systems, Inc ............................................. Richard A. Strasser Co.
Anlabs, Inc ............................................................. Jay E. Stone & Assoc.
Applied Technology, Inc .......................................... Mason Electronics
Associated Testing Laboratories, Inc ..................... Mason Electronics
Astrodata, Inc ........................................................ Mason Electronics
Astron (Skille Electronics) Corp ................................ Long & Assoc., Inc.
Avnet Instrument Corp ............................................ W. K. Geist Co.

Ballantine Labs, Inc ............................................... Carl A. Stone Assoc., Inc.
Barnes Engineering Company ................................. Costco & Co.
Baxter Electric Company ......................................... Tom G. Maier Company
Bausch & Lomb, Inc .............................................. Perlmuth Electronics
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Boonton Electronics Corp ........................................ O’Halloran Associates
Boonton Radio Corp ................................................ Nealy Enterprises
Bur-Brown Research Corp ...................................... W. K. Geist Co.

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Cascade Research .................................................. Mason Electronics
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Commo Corporation ................................................ Ault Associates
CircuitDyna Corp .................................................... T. Louis Smitzer Co.
Clairox Corp .......................................................... Mason Electronics
Clay Arithmetic Centers ........................................... American Wireless
Components Engineering & Mfg. Co ....................... Premmco
Computer Instruments Corp .................................... Components Sales Calif.
Computer Measurements Co .................................. Components Sales Calif.
Consolidated Ceramics & Metalizing ....................... Artwel Electric, Inc.
Continental Connector Co ....................................... J. Logan & Assoc.
Continental Soldering ............................................. Birnbaum Sales Co., Inc.
Continental-Wirt Electronics Corporation ............... Tom G. Maier Company
Control Logic, Inc. ..................................................... J. Logan & Assoc.
Control Switch Div., Controls Co. of America .......... Ballico
Coopertronics, Inc .................................................... T. Louis Smitzer Co.
CTS Corp .............................................................. J. Logan & Assoc.

Dgs Div, Thompson Ramo Wooldridge ......................... Nealy Enterprises
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Datamatic Corporation ......................................... Mason Electronics
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Digiltronics Corp ...................................................... Components Sales Calif.

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Hughes Vacuum Tube Products Division ............... Ballico

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International Resistance Co .................................. J. Logan & Assoc.

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J-Omeg A Company ............................................... Mason Electronics
J-V-M Microwave .................................................. James S. Heathon Co.

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22 Devonshire Blvd, San Carlos; 591-6260

Artwel Electric, Inc
1485 Bayshore Blvd, San Francisco; JU 6-4074

Ault Associates
120 Santa Margarita, Menlo Park; DA 6-1760

Balsco
Box 907, Palo Alto; DA 1-8501

Birnbaum Sales Company, Inc
626 Jefferson Ave., Redwood City; EM 8-7757

Cain & Company
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Comar San Francisco
120 Santa Margarita, Menlo Park; DA 6-1760

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Palo Alto; DA 6-5317

Costello & Company
535 Middlefield Road, Palo Alto; DA 1-3745

Dynamic Associates
1011-D Industrial Way, Burlingame; 344-1246

Geist Co., W. K.
Box 643, Cupertino, Calif.; YO 8-1508, AL 3-5433

Heaton Co., James S.
413 Lathrop St., Redwood City; EM 9 4671

Instruments for Measurements
251 So. Murphy Ave., Sunnyvale; RE 6-8880

Logan & Associates, Jack
801 Mahler Road, Burlingame; OX 7-6100

Long & Associates, Inc
505 Middlefield, Redwood City; EM 9-3324

Maier Co., Tom G
Suite 717, 375 S. Mayfair Ave., Daly City; PL 5-5566

McCarthy Associates
1011-E Industrial Way, Burlingame; 342-8901

McDonald Associates
716 Wilshire Blvd, Santa Monica; 394-6610

December 13, 1962
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### REPRESENTATIVE DIRECTORY

- **Mason Electronics**
  - 15-41st Avenue, San Mateo, CA 94404

- **Neely Enterprises**
  - 501 Laurel, San Carlos: 94070
  - 1317-15th St., Sacramento: CA 95820
  - 2-8901

- **O'Halloran Associates**
  - 3821 E. Bayshore
  - Palo Alto: DA 6-1493

- **Peninsula Associates**
  - 1325 Hancock Street, Redwood City: CA 94062

- **Perlmuth Electronics**
  - 941 Charleston Rd., Palo Alto: DA 1-5064

- **Premmc Co., Inc.**
  - 2405 Lincoln Ave., Alameda: CA 94501

- **Recht Associates, Elliott**
  - 175 S. San Antonio Rd., Los Altos: 94024

- **Rupp Co., V. T.**
  - 1182 Los Altos Avenue, Los Altos: 94033

- **Schnitzer Co., T. Louis**
  - 501 S. Mathilda Avenue, Sunnyvale: CA 94086

- **Strickler Company, John E.**
  - 510 B. S. Mathilda Avenue, Sunnyvale: CA 94086

- **Stone Associates, Carl A.**
  - 800 N. San Antonio Road, Palo Alto: DA 1-2724

- **Thompson Associates, R. W.**
  - 4135 El Camino Real, Palo Alto: DA 1-6383

- **Vauhnn Co., G. H.**
  - 1253, Palo Alto: DA 1-6383

- **Walter Associates**
  - 790, Palo Alto: DA 1-6383

- **Whycelco, Inc.**
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MEMBERSHIP

Following are the names of members who have recently been transferred to a higher grade of membership as noted:

**Senior Member**
G. F. Reiling
James J. Spilker, Jr.

Following are the names of individuals who have been elected to current membership:

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<th>Z. J. Balogh</th>
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<td>K. C. Bulsara</td>
<td>J. V. Miller</td>
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<td>R. A. Clay</td>
<td>G. T. Moore</td>
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<td>E. B. Crosson</td>
<td>W. H. Sanders</td>
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<td>J. M. Donachy</td>
<td>L. E. Salmer</td>
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<td>A. F. Gaetano</td>
<td>E. G. Shoemaker</td>
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<td>F. K. Gates</td>
<td>J. W. Simonton</td>
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<td>E. Gee</td>
<td>W. B. Tiffany</td>
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<td>M. C. Harding</td>
<td>C. P. Tinebra</td>
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<td>A. A. Kaplan</td>
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<td>R. E. Larson</td>
<td>H. Van Ardenne</td>
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<td>N. H. T. Lowe</td>
<td>R. A. Zebeli</td>
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Following are the names of IRE members who have recently entered our area, thereby becoming members of the San Francisco Section:

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<th>W. L. May</th>
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<td>E. J. Archibald</td>
<td>K. K. Mei</td>
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<td>Robert B. Ash</td>
<td>L. Meier III</td>
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<td>Albert Blodgett, Jr.</td>
<td>T. C. Nelson</td>
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<td>J. J. Boncer</td>
<td>R. P. Noble</td>
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Opportunity in Montana
As a result of the expanding program at the Electronics Research Laboratory of the Endowment and Research Foundation at Montana State College, the Laboratory has openings for experienced research and development engineers in systems synthesis, solid-state microwaves, communications, direction finding and antennas.

Send résumé to:
C. M. Sorvaag, Staff Member, Electronics Research Laboratory, Montana State College, Bozeman, Montana

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(100X attenuation)

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- Overvoltage taps standard on all models.
- Ganged and motor-driven models available.

Type M5 Variac® Continuously Adjustable Autotransformer

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<tr>
<th>Type</th>
<th>Rated Input Voltage</th>
<th>Line-Voltage Connection</th>
<th>Overvoltage Connection</th>
<th>Net Weight Pounds</th>
<th>Price</th>
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<td>M5</td>
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*Rated current should not be exceeded for the overvoltage connection.

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