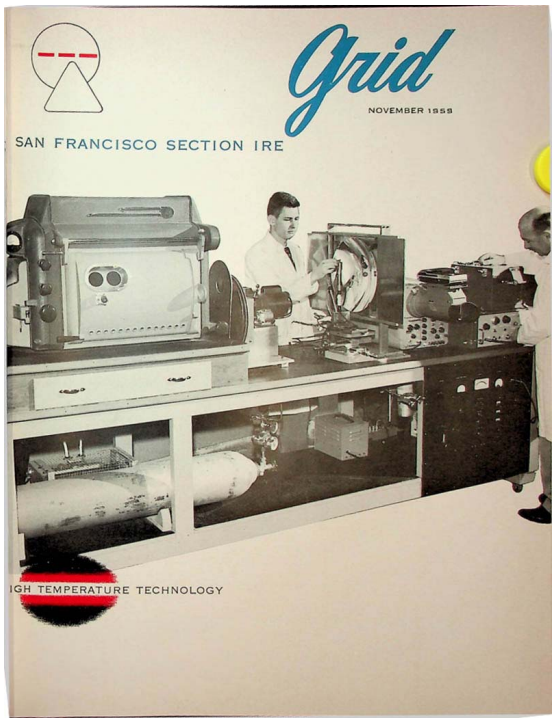
EDITOR'S PROFILE of this issue

from a historical perspective …

with Paul Wesling, SF Bay Area Council GRID editor (2004-2014)



November, 1959:

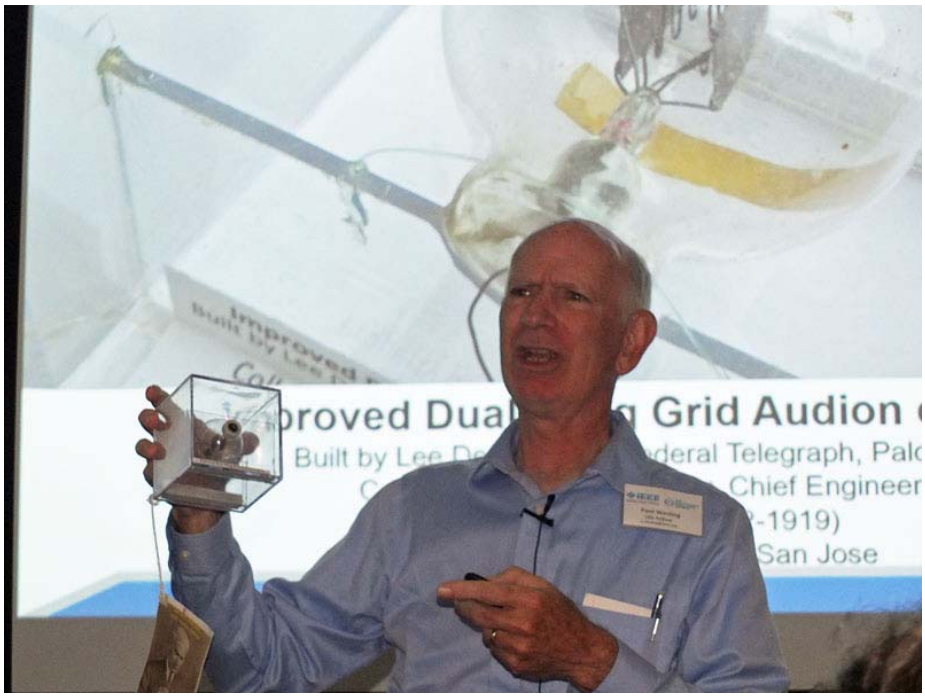
Cover: An image furnace at SRI is used to ignite solid propellants and measure the energy output (page 10).

Page 6: With membership at 3,600 and growing 10% each year, the Section needs to centralize services to the groups (chapters). A listing shows the tasks and services that might be provided by dedicated staffing and standardized processes.

Page 12: A photo shows Doug Perham showing an electron tube to a visitor to the New Almaden Museum. The article says he's starting a 10-lecture class on the "History of Electronics", of which he was a key player. Our first electronics company – Federal Telegraph – was located at his home and property in Palo Alto for a number of years, and Lee de Forest (inventor of the electronic vacuum tube, the oscillator circuit, and the amplifier circuit) used one of the buildings there for several years. At some point in the future, he'll start the Perham Foundation and the Foothill College Electronics Museum (which many of us visited). Unfortunately, Foothill decided not to continue housing the museum; many of its collections are now at the History San Jose site, where portions are occasionally put on display. I have access to an Audion tube (below) that were manufactured in about 1913, while Perham was Chief Engineer at Federal Telegraph.

Page 17: An artist's sketch shows a 142-foot radio-telescope that is going to be built on a hill behind the Stanford campus. Its million-watt transmitter will study the sun and planets by radar. We know it today as "The Dish".

Page 38: Bernard Widrow moves to a position at Stanford, and shows up in the listing of new-to-the-area IRE members. He goes on to become the director of SLAC. I met with Bernard a few years ago and he agreed to be on my panel on the klystron for the Section's Silicon Valley Technology History committee. Unfortunately, he was ill at the time of the panel, so wasn't able to participate. Lofti Zadeh moves into the area for a position at UC-Berkeley; his specialty was fuzzy sets and fuzzy theory, a generalization of classical and Boolean logic, and the Z-transform for signal processing.

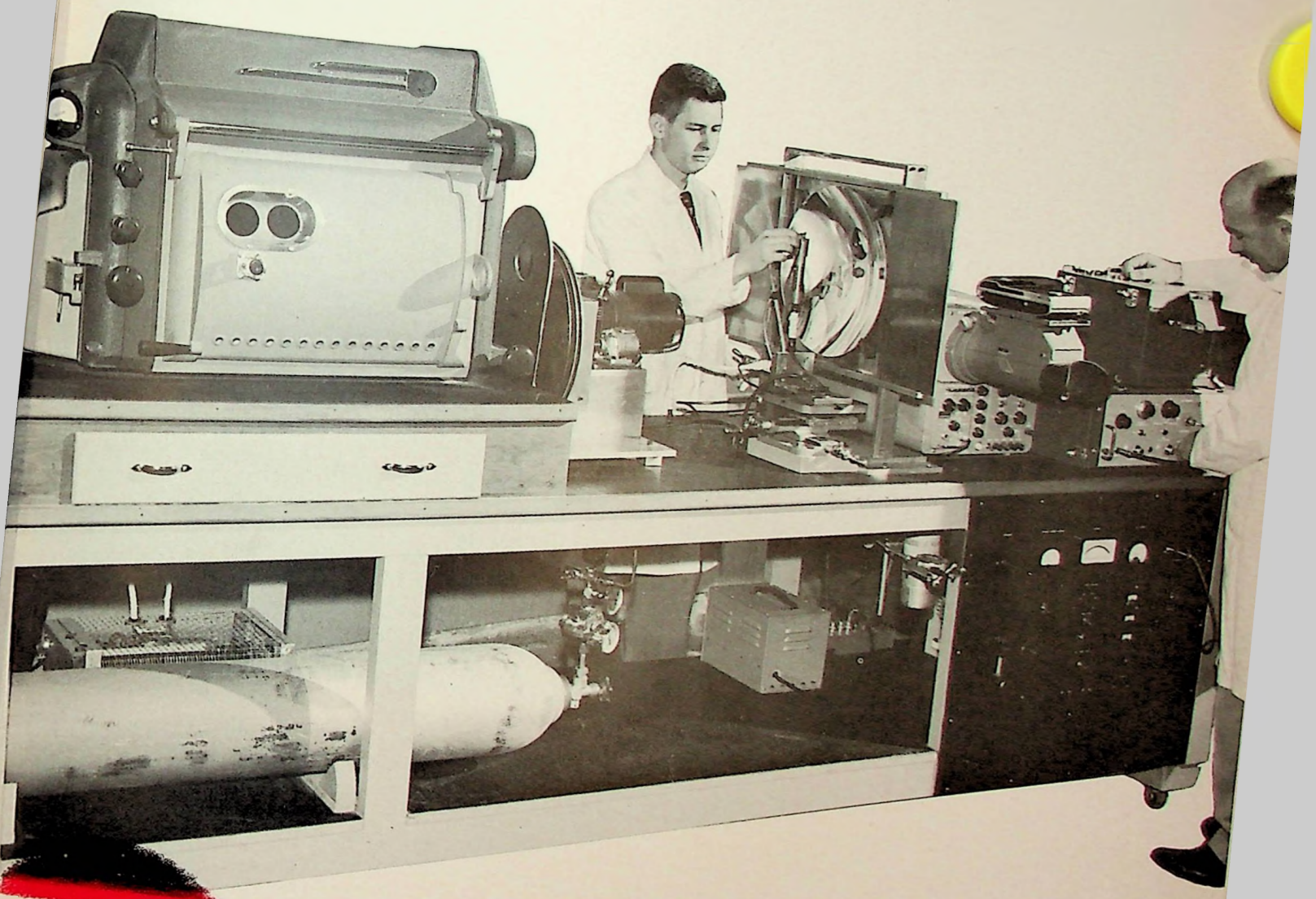


Archive of available SF Bay Area GRID Magazines is at this location:
https://ethw.org/IEEE_San_Francisco_Bay_Area_Council_History

Grid

SAN FRANCISCO SECTION IRE

NOVEMBER 1959



IGH TEMPERATURE TECHNOLOGY

NOW! TRANSISTORIZED 100-600 AMPERES DC POWER SUPPLY

by PERKIN!

Response time adjustable to 20 milliseconds . . .

Excellent dynamic load regulation . . . low ripple

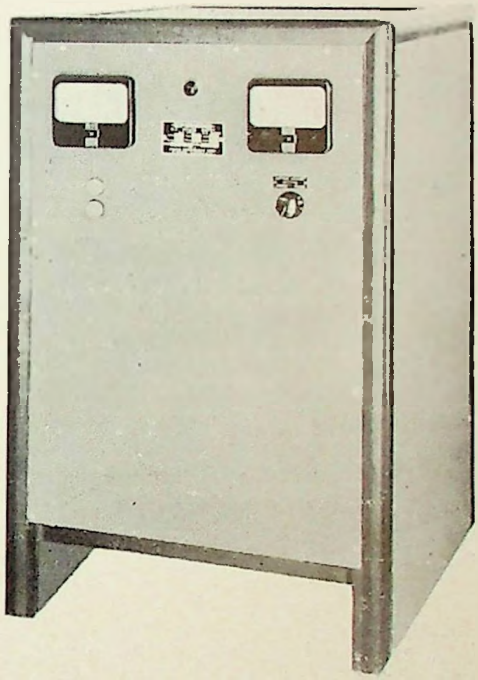
Proven in production use in the . . .

THOR . . . BOMARC . . . ATLAS . . .

JUPITER . . . POLARIS . . .

VANGUARD AND LA CROSSE

MISSILE PROGRAMS



SPECIFICATIONS

A.C. INPUT: 208/230/460 volt ±10%, 3 phase, 60 cycle.

RIPPLE: Less than 1% RMS.

RESPONSE TIME: A special control internally mounted in the Power Supplies handles adjustment of response time. The "load on" response time is adjustable from 20 to 200 milliseconds, and the "load off" from 40 to 400 milliseconds. An important advantage of this adjustable response is when used with inductive loads, such as inverters; recovery can be adjusted to avoid interaction between inductive load and power supply.

RATINGS AVAILABLE:

Model Number	D.C. Output		Regulation		Dimensions W" x H" x D"	Weight Lbs.
	Volts	Amps	Static-Line or Load	Dynamic-Load*		
MRST28-100	24-32	100	±0.1%	±6V	22"x36"x22"	430
MRST28-200	24-32	200	±0.1%	±6V	22"x36"x22"	550
MRST28-300	24-32	300	±0.1%	±6V	22"x46"x22"	700
MRST28-400	24-32	400	±0.1%	±6V	28"x58"x24"	1250
MRST28-500	24-32	500	±0.1%	±6V	26"x68 ½ x32"	1650
MRST28-600	24-32	600	±0.1%	±6V	26"x68 ½ x32"	1650
MRST2440-250	24-40†	250	±0.1%	±2V	26"x68 ½ x32"	1650

* For Full Load Charge

† In 2 Ranges

TECHNICAL DESCRIPTION

These units use silicon power rectifiers for increased reliability and efficiency. Silicon rectifiers provide constant efficiency and exhibit no aging characteristics as is more common in other type rectifiers. Magnetic components utilize grain oriented silicon steel and Class B insulation for compact design and efficient operation. The power section consists of a 3 phase magnetic amplifier with extremely high gain. Preamplifier is fully transistorized and utilizes silicon zener diodes as a reference element.

ADDITIONAL FEATURES

Output of units can be shorted without damage to the silicon rectifiers.

Units can withstand 400% overload for periods up to 1 second without damage to Power Supply components.

Remote sensing
low output impedance

Militarized versions of above units are also available.

For additional data contact factory or sales offices below:

Albuquerque, N.M. AMherst 8-1724
Angola, Ind. 217 & 8101-R
Atlanta, Ga. BLackburn 5-6660
Chicago, Ill. JUniper 8-0905
Cleveland, Ohio REdwood 2-7444
Dallas, Tex. FLeetwood 7-7080
Dayton, Ohio CHapel 4-5551
Denver, Colo. SUnset 1-7375
Detroit, Mich. HOward 8-2461
Indianapolis, Ind. STate 7-0009
Kansas City, Mo. HEdrick 2-2528
Los Angeles, Calif. HOllywood 9-7294
Minneapolis, Minn. Midway 6-2621
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PERKIN

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or EAstgate 2-1375.

New England Area Office: 46 Amesbury, Lawrence, Mass. • MUrdock 3-3252

SAN FRANCISCO SECTION

Grid

VOLUME 6 NOVEMBER 1959 NUMBER 3

(Continued on page 8)

IN THIS ISSUE

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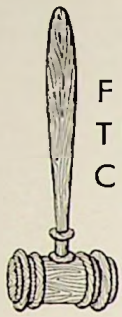


FROM THE CHAIRS

Stanley F. Kaisel

Helping Hands

As the San Francisco Section of the IRE has grown in size, the mechanics of Section operation have correspondingly increased in magnitude and scope. Including the projected increase in membership for the year, the needs of over 3600 members must be served.

With over 100 meetings to arrange, schedule, and publicize; with the publication of a professional-level Section magazine; and with a turnover of funds of almost $50,000 this year; Section activity is a big business. This scale of activity requires a focal point for the repetitive handling of the details of Section operation. At this level of activity it is apparent that economies can be achieved by centralizing the mechanics of Section operation. This focal point, of course, is the IRE Office in San Mateo.

The Section and professional group officers have a time-consuming job on their hands in managing the affairs of the Section. The facilities of the IRE office are being provided as a service to these individuals in order to reduce the load on them and their individual organizations. However, direction of the activities of the IRE office must still come from the Section and professional group officers.

In order to acquaint the Section membership with the present and contemplated services available from the IRE Office, the accompanying list is presented.

The IRE Office should provide continuity required for Section operations on a year-to-year basis. Standardization of procedures can come from this source. The office, with the guidance of Section officers, will generate check lists, deadline dates, etc., for the guidance of future officers, thereby making the orderly transition of officers' jobs possible. With time we hope to develop a simple manual describing the duties, procedures, and timetable for the performance of each office.

Financial support for the IRE Office activities is provided from two sources. The Section treasury contributes to a portion of this cost. WESCON has contributed substantially to the support of the IRE office in the last few years and for the present year will provide a majority of the financial support. Each year the WESCON directors allocate funds in their budget for the use of the San Francisco and Los Angeles Sections, to be used as the Sections see fit, for the general purpose of promoting Section activities.

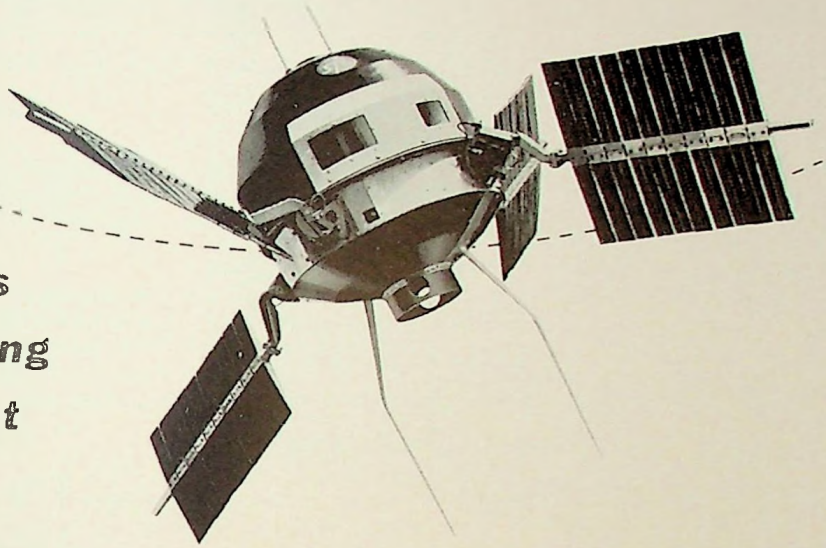
Both Sections have chosen to receive this help from WESCON in the form of services of secretarial and clerical personnel to aid the Section and professional group officers in performing their duties. In addition to providing personnel for IRE use, WESCON also supplies the "overhead" function in the form of physical space and facilities in which to work. This support is one of the several ways in which the IRE's joint sponsorship and ownership of WESCON with WEMA furthers the activities of the Section.

—*S. F. Kaisel, secretary, SFS*

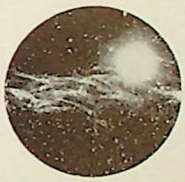
IRE Office Services

1. Assistance to the Editor of the **Grid**
   a. Maintenance of up-to-date **Grid** mailing lists exclusive of Section membership
   b. Correspondence
   c. Proofreading
   d. Calls for editorial material
2. Services to the Section administration
   a. Mailing monthly bulletin-board notices
   b. Mailing special meeting notices
   c. Depository of membership card files
   d. Provide meeting place for small groups
   e. Maintain central Section files
   f. Section reports
      (1) Follow-up on submission of reports to Section officers
      (2) Prepare reports to IRE headquarters
3. Maintain and coordinate mailing strip lists
   a. Section lists
   b. Professional group lists
4. Handle special group mailings for Section committees and professional groups
5. Provide duplicating facilities that do not require sending copy to Los Angeles. Expedite pickup of copy where necessary.
6. Assist Section in routine publicity releases on meetings
7. Handle telephone inquiries regarding IRE, meetings, membership, etc.
8. Maintain adequate stocks of IRE supplies and distribute as requested
   a. Section and professional group stationery
   b. Report forms
   c. Membership
   d. IRE pamphlets
9. Stock a supply of check lists for the different officers, professional groups, and committees
   a. Things to be done
   b. Deadline dates
10. Maintain a library of procedural handbooks on symposia
11. Assist in making arrangements for meetings and reservations for dinners
12. Provide a list of services available to each Section officer, committeeman, and representative

Explorer VI is a space laboratory orbiting around the earth with paddles capturing sunlight for power



The scientific data that will some day enable us to probe successfully to the very fringes of the universe is being recorded and transmitted at this moment by the space laboratory Explorer VI, a satellite now in orbit around the earth ● This project, carried out by Space Technology Laboratories for the National Aeronautics and Space Administration under the direction of the Air Force Ballistic Missile Division, will advance man's knowledge of: *The earth and the solar system . . . The magnetic field strengths in space . . . The cosmic ray intensities away from earth . . . and, The micrometeorite density encountered in inter-planetary travel* ● Explorer VI is the most sensitive and unique achievement ever launched into space. The 29" payload, STL designed and instrumented by STL in cooperation with the universities, will remain "vocal" for its anticipated one year life.



How? Because Explorer VI's 132 pounds of electronic components are powered by storage batteries kept charged by the impingement of solar radiation on 8,000 cells in the four sails or paddles equivalent to 12.2 square feet in area ● Many more of the scientific and technological miracles of Explorer VI will be reported to the world as it continues its epic flight. The STL technical staff brings to this space research the same talents which have provided systems engineering and over-all direction since 1954 to the Air Force Missile Programs including Atlas, Thor, Titan, Minuteman, and the Pioneer I space probe.

Important staff positions in connection with these activities are now available for scientists and engineers with outstanding capabilities in propulsion, electronics, thermodynamics, aerodynamics, structures, astrophysics, computer technology, and other related fields and disciplines.

Inquiries and resumes are invited.

Space Technology Laboratories, Inc.

P. O. Box 95004
Los Angeles 45, California

Staff (cont.)—Reporters

SAN FRANCISCO SECTION

Steve Duer, Hewlett-Packard Co.

Dexter Hartke, (Photography), Hewlett-Packard Co.

EAST BAY SUBSECTION

Eugene Aas, Sandia Corporation, Livermore

Hugh Gray (Photography) Hugh Gray Co., San Francisco

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BROADCASTING
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Lee Stephens (Photography) Lenkurt Electric Co.

ELECTRON DEVICES
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ELECTRONIC COMPUTERS
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Julian Hilman, Fairchild Semiconductor, Palo Alto

SPACE ELECTRONICS & TELEMETRY
Robert B. Morgan, Lockheed Missiles and Space Division, Sunnyvale

INSTITUTIONS

D. J. Angelakos, Cory Hall, University of California, Berkeley 4

MEETING CALENDAR

PROFESSIONAL GROUPS

Broadcasting
8:00 P.M. • Tuesday, Dec. 8
(Joint meeting with SMPTE)
"Six Weeks in Russia with the VTR"
Speaker: Joe Roizen, manager, video products information, Ampex Corp.
Place: KGO-TV Studios, 277 Golden Gate Avenue, San Francisco
Dinner: 6:00 P.M., Rathskeller, Polk and Turk, San Francisco

Electron Devices
7:30 P.M. • Monday, Nov. 16
"One Hundred Years of Progress in Parametric Devices'
Speaker: Glen Wade, associate professor, electrical engineering, Stanford
Place: Room 100, Physics Lecture Hall, Stanford University

(Joint meeting with PGMTT—see below) **8:00 P.M. • Wednesday, Dec. 2**

Electronic Computers
8:00 P.M. • Tuesday, Nov. 24
"Computer Activities in Japan"
Speaker: Eiichi Goto, professor, University of Tokyo, Japan
Place: Auditorium, Lockheed Missiles and Space Division, Palo Alto
Dinner: 6:00 P.M., Hal's Restaurant, 4085 El Camino Way, Palo Alto

Engineering Management
8:00 P.M. • Tuesday, Dec. 8
"Management of Research & Development Enterprises"
Speaker: John Church, Booz Allen & Hamilton
Place: Hal's Restaurant, 4085 El Camino Way, Palo Alto
Dinner: 6:30 P.M. (Social hour 5:45), Hal's Restaurant
Reservations: Mrs. Marie Iavicoli, LYtell 1-8461, Ext. 461

Medical Electronics
8:00 P.M. • Tuesday, Nov. 24
"The Nerve Cell and Memory Components"
Speakers: Albert S. Hoagland, manager of magnetic memory research, International Business Machines, San Jose; Keith Killam, associate professor of pharmacology, Stanford Medical School, Stanford; and Charles A. Rosen, head, applied physics, Stanford Research Institute
Place: Room M-112, Medical School Building. (Room M-112 is in the courtyard of the wing nearest Hoover Tower. Approach from Palm Drive, the extension of University Avenue
Dinner: 6:00 P.M., Red Cottage, 1706 El Camino Real, Menlo Park
Reservations: George Turner, DAvenport 5-8332, 2950 Ross Rd., Palo Alto

Microwave Theory & Techniques
8:00 P.M. • Wednesday, Dec. 2
(Joint meeting with PGED)
"Microwave Generation Using Ferrites"
Speaker: John Shaw, Stanford University
Place: Room 101, Physics Lecture Hall, Stanford University

Military Electronics
8:00 P.M. • Tuesday, Dec. 1
"Current Techniques and Procedures for Electronic Reliability Assurance"
Speaker: Rudolph Cazanjian, reliability supervisor, Sylvania
Place: Auditorium, Lockheed Missiles and Space Division, Palo Alto

Production Techniques
8:00 P.M. • Tuesday, Nov. 24
(Joint meeting with PGRQC)
"Maintenance of Electronic Instrumentation"—a plant tour
Place: Main entrance, United Airlines Maintenance Base, San Bruno Avenue and Airport Blvd., San Francisco International Airport

Reliability & Quality Control
8:00 P.M. • Tuesday, Nov. 24
(Joint meeting with PGPT, see above)

CHRONOLOGICAL RECAP

November 16—Electron Devices
November 24—Electronic Computers, Medical Electronics, Production Techniques/Reliability & Quality Control
December 1—Military Electronics
December 2—Microwave Theory & Techniques/Electron Devices
December 8—Broadcasting, Engineering Management

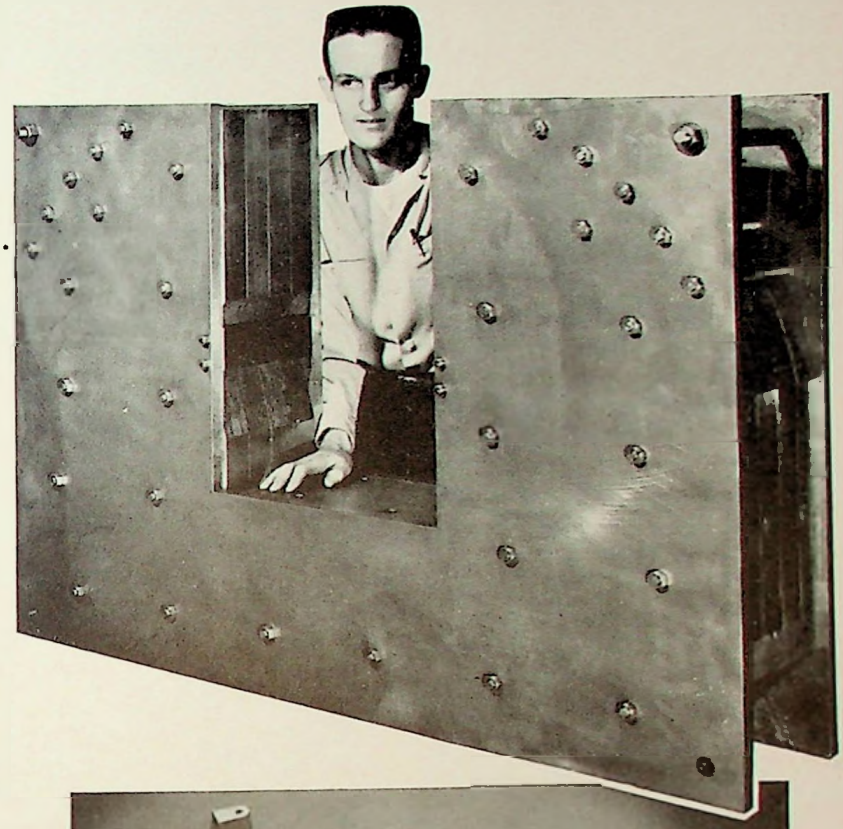
Arnold Builds World's Largest Permanent Magnet...Used in Atomic Research

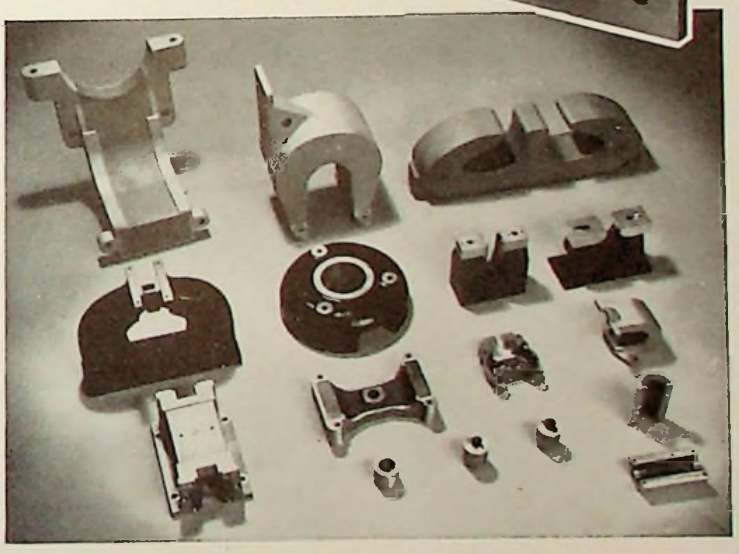
Vital Statistics on the Big Magnet

Here's how the world's champion permanent magnet weighed in: 1720 pounds of Alnico V in the assembly . . . a keeper weighing 225 pounds . . . a total shipping weight of a little over 2 tons.

Overall dimensions of the magnet assembly, as illustrated at right, were 52½" x 36" x 10", with a gap length of 16.5". The gap volume was 1584 cu. inches, and the density at the center of the gap was 1100 gausses.

Approximately 500,000 ampere turns were required to magnetize the big unit, which was shipped magnetized and keepered. It was designed for use in auxiliary equipment serving a breeder reactor for the Argonne National Laboratory, operated by the University of Chicago for the U.S. Atomic Energy Commission. Actual service is in an electro-magnetic pump for pumping fluid metals.





Top: the world's largest permanent magnet, built by Arnold for Argonne Labs, was designed to supply a field of 1100 gausses in a gap of 16½ inches. Bottom: a typical group of the permanent magnet assemblies that Arnold supplies for rotors, traveling wave tube, wave guide and magnetron magnets, mass spectrometer and other measuring applications, etc.

Vital Suggestion for Your Requirements

The facilities and wealth of experience that produced this world's largest permanent magnet are ready to bring you advantages, too.

Arnold permanent magnets are available in all types of Alnico and other magnet materials, from large castings like the Argonne unit to very small sintered parts weighing less than a gram. Many sizes and types of Alnico magnets are carried in stock for immediate delivery.

Special assemblies—such as rotors, traveling wave tube and magnetron magnets, etc. —may be supplied jacketed to facilitate mounting and give added protection to the magnet. Arnold also can supply large magnet assemblies for mass spectrometer and other measuring applications, where a high degree of stability and uniformity of field is required.

• Ask for a copy of Bulletin GC-106C, for more information on Arnold permanent magnets and other products, (tape cores, powder cores and special magnetic materials).

ADDRESS DEPT. G-911

ARNOLD
SPECIALISTS in MAGNETIC MATERIALS

THE ARNOLD ENGINEERING COMPANY, Main Office: MARENGO, ILL.
DISTRICT OFFICE: 701 Welch Road, Palo Alto, Calif.
Telephone DAvenport 6-9302

ABOUT THE COVER

The Warm Peninsula

At Asilomar on the Monterey Peninsula some six hundred registrants gathered from October 6 to 9 to discuss the latest aspects of high-temperature technology. Although California accounted for about two hundred and fifty, a dozen or more came from abroad and other U. S. attendees from as far away as New Hampshire.

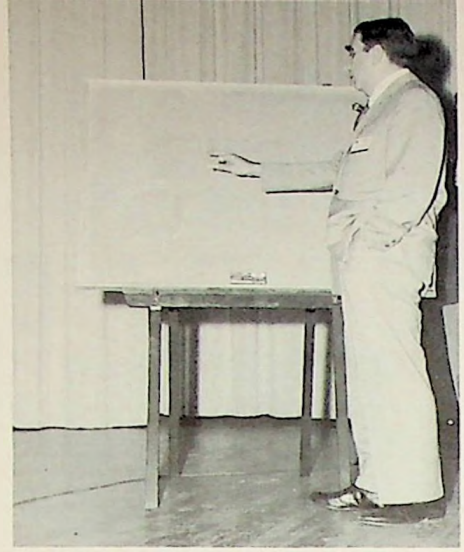
Arranged by Stanford Research Institute, the event was sponsored by the following: Air Force Office of Scientific Research, Air Research and Development Command; Army Research Office, Office of the Chief of Research and Development, Department of the Army; Atomic Energy Commission; National Aeronautics and Space Administration; National Science Foundation; Office of Naval Research; Aerojet-General Corporation; Corning Glass Works; Esso Research and Engineering Company; Gladding, McBean and Company; Fansteel Metallurgical Corporation; Food Machinery and Chemical Corporation; Hughes Aircraft Company; Radio Corporation of America; Stanford Research Institute; Union Carbide Corporation; and Westinghouse Electric Corporation.

Five sessions of twenty-three papers covered these topics: Techniques and Measurements, Materials, Processes, Behavior of Materials, and Research Abroad.

Two subjects offered particular electronic interest. These were Thermoelectric Power by C. M. Kelley, Stanford Research Institute; and Image-Furnace Research by C. P. Butler, Naval Radiological Defense Laboratory. Kelley described current investigative work at the Institute which seems likely to lead to the development of nuclear or chemical-heated power supplies suitable for portable electronic equipment.

Butler's paper provided material for the cover of this issue with assistance by SRI. The main illustration shows an image furnace at use in the Institute for research on the ignition of solid propellants. Instrumentation shown at right is used to measure the carefully metered amount of energy supplied to the propellant from the image furnace. Oscilloscope traces shown here indicate three levels of irradiance applied to a specimen of a solid propellant. When the irradiance is sufficiently high and near the threshold energy value for a specific propellant, there is a characteristic delay time between cessation of the exposure and ignition of the material.

Photograph (a) shows the situation with too little energy input. The hump at the end of the exposure is due to ignition of volatilized gases. Picture (b) shows ignition occurring almost at the end of the exposure, giving a so-called minimum delay time. Picture (c) shows the application of more energy than required, in which case ignition begins before the end of the exposure.



Edward Teller, speaker at symposium on high-temperature technology

Several ladies' events were scheduled, including a special performance of "After Dark" in California's First Theatre, Monterey—a state historical monument. This performance was given in the spirit of the original plays presented in the theatre about 1850. During intermission one of the ladies was heard to say, "I never try to tell anyone what my husband does, because I don't even understand it."

The affair was wrapped up, after a final-day banquet, by Dr. Edward Teller, associate director of the University of California Lawrence Radiation Laboratory who spoke on the subject "Nuclear Technology and High Temperature." He described the production of high temperatures in the nuclear explosion 900 ft under a Nevada mesa two years ago and speculated on the possible production of materials ranging from fertilizer to diamonds by these means. He discussed the problems being encountered in controlled thermonuclear power production and summed up the situation by stating that the unknown factors today are about the same as those five years ago except that today they are unknown on the basis of much better evidence.

MEETING AHEAD

Century I in Parametric Devices

Glen Wade of Stanford will talk about "One Hundred Years of Progress in Parametric Devices" at the November 16 meeting of PGED. See the Calendar on page 8 for details.

Although this talk will treat briefly some experimental electron devices of the past, the main emphasis will be on recent developments. A summary will be given of the characteristics and attainments, particularly regarding low noise, of solid-state and electron-beam parametric amplifiers.

The basic principle of operation of microwave parametric devices has been understood for a long time. The principle involves means of transferring energy into a dynamical system when an energy storage element of the system is caused to vary with time in an appropriate fashion. The principle works for many different dynamical systems making possible parametric operation with many physical embodiments. The talk will review and compare the more attractive of these embodiments and discuss recent developments.

Wade received the BS and MS degrees in electrical engineering from the University of Utah in 1948 and 1949, respectively. He did graduate study at Stanford University where he was first

(Continued on page 12)

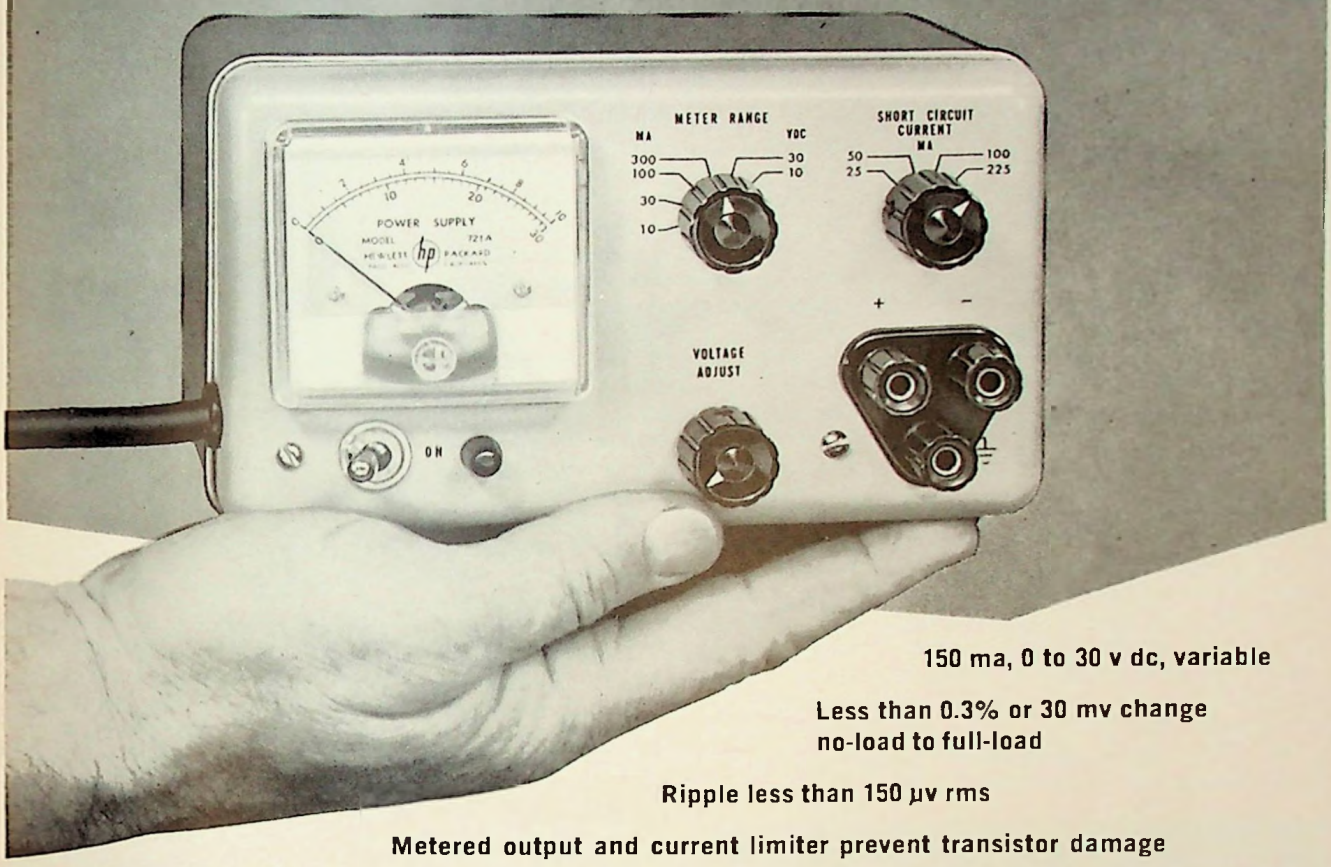
Clinton M. Kelley

C. P. Butler

compact, $145, 150 ma

TRANSISTOR POWER SUPPLY

prevents overload damage to transistors!



150 ma, 0 to 30 v dc, variable

Less than 0.3% or 30 mv change no-load to full-load

Ripple less than 150 μv rms

Metered output and current limiter prevent transistor damage

hp 721A TRANSISTOR POWER SUPPLY

Model 721A was designed from the chassis up to provide safe, precision test voltages for almost all types of transistors in use today.

An outstanding feature is an output limiter, holding current to 25, 50, 100 or 225 ma as selected on the front panel. Accidental overloads are eliminated.

Model 721A has a 3-terminal output for grounding either positive or negative terminals. It may be "stacked" on another voltage, and a front panel meter monitors either output voltage or current, eliminating extra equipment.

Other -hp- regulated and klystron supplies

Model	Characteristics	Regulation	Current	Voltage Range	Hum & Noise Level	Price
711A	General purpose dc supply	Less than ±0.5% or 1.0 v, no load to full load	100 ma	0 to 500 v dc; 6.3 v ac	Ripple less than 1.0 mv	$250.00
712B	Heavy duty, 4 outputs, 0.1 msec transient response	Less than 50 mv no load to full load	200 ma (pos. dc)	0 to 500 v dc; -300 v dc fixed bias; 0 to -150 v dc variable bias; 6.3 v ac	Ripple less than 500 uv	365.00
715A	Klystron supply; square wave, external modulation	Less than 1%, no load to full load	50 ma (at 400 v)	250 to 400 v dc beam; 0 to 900 v dc reflector; 6.3 v ac	Ripple less than 7 mv	300.00

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

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MORE PARAMETRIC DEVICES

a Sperry Fellow and then an RCA Fellow in Electronics, receiving the PhD degree in 1954. He had worked for a year at the Naval Research Laboratory in Washington, D. C., and after receiving the PhD, was employed as a research associate by the General Electric Microwave Laboratory at Stanford. At present he is an associate professor of electrical engineering at Stanford and a senior staff member of the Stanford Electronics Laboratories.

Wade received an Eta Kappa Nu Award in the "Outstanding Young Electrical Engineer" competition in 1955. He is a member of IRE, the American Physical Society, Phi Kappa Phi, Tau Beta Pi, Eta Kappa Nu, and Sigma Xi.

MEETING AHEAD

Room-Temperature Masers?

Ferrites can store energy supplied by a pulsed d-c magnetic field and radiate this energy coherently at microwave frequencies. Generators of this type will be discussed by John Shaw at the December PGMTT/PGED meeting. See Meeting Calendar, page 8. An experimental model of a new device of this kind will be described which uses an r-f pumping signal at a lower frequency and provides output at a higher frequency. The possible application of this principle to millimeter-wave generation will be considered.

The relationship of these devices to pulsed masers will be considered, and a possibility of making true masers with ferrimagnetic materials will be discussed. Such applications are of interest because these materials have higher spin density than paramagnetic maser crystals, and because they operate at room temperature.

—T. Moreno

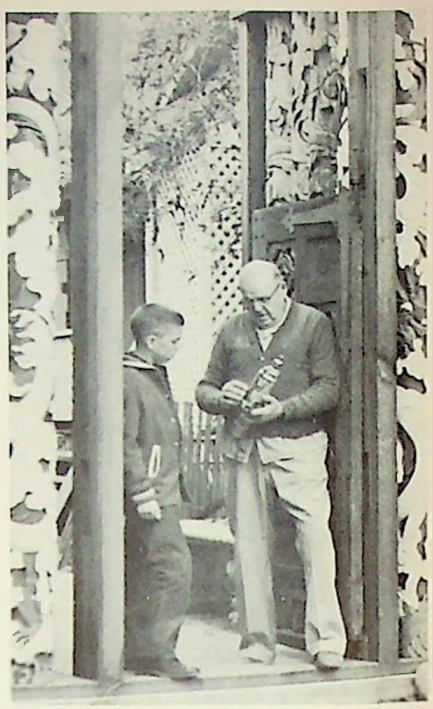
MEETING AHEAD

Behind the Iron Curtain With Magnetic Tape

When Joe Roizen went to Russia as the chief project engineer in charge of installation, supervision, and maintenance of the famous Ampex recorder at the American National Exhibition, he found time to take a plethora of pictures, both 16-mm movies and 35-mm slides. He has made a tasteful selection of this photographic account, which he will present to the December 8 gathering of the Professional Group on Broadcasting and the SMPTE (see Meeting Calendar, page 8). PGB Chairman Harry Jacobs has observed that the ladies will find the program interesting, and they are therefore cordially invited.

Before his departure, Joe brushed up on his Russian, which he learned at home—in Canada. His parents were born in Kiev, and in 1923, while they were awaiting a Canadian visa, Joe was born in Romania. Subsequently, the family settled in Montreal, where he attended high school. He pursued his higher education at Sir George Williams University, McGill University, and UCLA.

Roizen, speaker for the December PGB/SMPTE meeting; Jack Miller, both of Ampex; and Chief Justice Earl Warren



Doug Perham in gateway at New Almaden Museum explains early electron tube to young visitor

LECTURE SERIES

Word From a Pioneer

Douglas Perham, pioneer and renowned personage in the field of electronics, will offer a course starting Tuesday, January 19, 1960, at Campbell Evening Adult School, 151 N. Winchester Road, Campbell, in the "History of Electronics," according to Edward Stanley, director of adult education, Campbell Union High School District.

During his busy career, Perham has been an associate of de Forest, Varian, Lawrence and many of the greats in electronics since 1910. He has had intimate acquaintanceship with prominent figures in the field of electronics and has made a multitude of original contributions to the new inventions.

The historical committee of the San Francisco Section, IRE, through Jerry Rosenberg, committee member, is assisting in this service to the combined fields of electronics, history, and science.

Classes will be limited to 20 persons, with 10 meetings per lecture series. The series will be continued so that interested persons will have an opportunity to participate in this lecture and discussion program.

Reservations for the class should be made by phoning FRanklin 8-3481, adult education office, Campbell, or writing to E. P. Stanley, 151 N. Winchester Road, Campbell. Registration may be completed any day or Monday, Tuesday, Wednesday, or Thursday evening at the above address.

ASCS

What, Another Society?

Based on the assumption that engineers and laboratory personnel concerned primarily with electrical measurements and standards need to exchange techniques and methods with lab people from other companies, a new organization known as the American Society for Calibration and Standardization has sprung into existence here in the San Francisco Bay Area.

The new group has already held six informal meetings, has another one scheduled for November 23 when Robert Hammond, chief engineer of John Fluke Manufacturing Co., will speak on Kelvin Varley Bridges and a-c to d-c converters. Officers will also be elected at this meeting, a nominating committee being in existence.

A membership committee is also active and includes Robert DeLapp, LMSD, Sunnyvale; Robert Fosdick, IBM Corp.; Wallace Max, IBM Corp.; Richard Thompson, Dalmo Victor Co.; and James Williams, G.E. Microwave Lab. Further information on this new group can be obtained from Dale Kastle, McCarthy Associates, DAvenport 6-7937.

MEETING REVIEW

Computer Saver

The meeting of PGSET originally scheduled for September, was held on the first day of October in the auditorium of Lockheed Missiles and Space Division, Palo Alto. G. O. Moore presided.

J. M. Rosenberg reported on the activities of the committee on program and papers. He announced plans to continue the "Meet-the-Speaker" dinner before every meeting. The chairmanship of the committee will be rotated among the committee members in order to provide more varied programs.

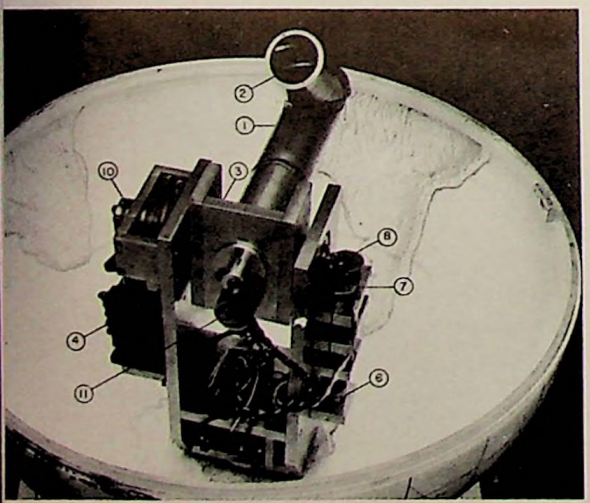
Speaker of the evening was R. F. Mitchell, photographic and optical specialist in the Western Development Laboratories, Philco Corporation, Palo Alto. The title of his paper was "A Satellite Orbit Simulator."

The principal uses of the device include the simulation of orbits before launching space vehicles, and location of the position of any satellite at any given time, and the tracing of a series of orbits. The orbits can be shown in either real time or fast time as occasion warrants. The device is accurate to within a few minutes for periods up to several days. Its main advantage lies in its ability to save expensive computer time when used for determinations within its limitations.

—Robert B. Morgan

At right—overall view of Philco satellite-orbit simulator

Below — interior view with northern hemisphere removed, parts are as follows: (1) Lamp house, (2) Lens, (3) Orbit-inclination platform, (4) Orbit-inclination-platform motor, (6) Gear reducer—90 to 1, (7) 2-way clutch, (8) Gear reducer 16,000 to 90, (10) Orbit-inclination platform sensing servo, and (11) Lamp-house rotation sensing servo



MEETING REVIEW

Crowded Components

A relatively new science was artfully described at the October 19 PGED meeting by Dr. Dietrich Jenny of the David Sarnoff Research Laboratories of RCA (Princeton, New Jersey). He talked of amazing component densities achieved in the field of "Integrated Electronics." Computer circuits have already been developed with a densities of 10^8 components per cubic foot (for comparison, the human brain houses 10^{11} components per cubic foot). This miniaturization eases the weight, size, and power consumption of systems for space travel, as well as for use in varied military and commercial applications.

It was strongly emphasized by Jenny that "all this is gravy." The true goal for Integrated Electronics is the sophistication of components, that is, the development of components which perform a myriad of functions. System development in the past has required a device and circuit stage following the basic research. Integrated Electronics, in contrast, combines the two to develop "functional components."

While one cannot date the start of thinking along the lines of functional components, there is no doubt that it took a major step forward in the days of "Project Tinker Toy." Tinker toys were stacked ceramic wafers (micromodules) each carrying a printed or miniaturized component. The completed array, sometimes attaining densities of 10^6 components per cubic foot, was functional since by itself it was an amplifier, an oscillator, a pulse generator, etc.

Presently the state of the art is represented by unipolar transistor circuits which attain packing densities of 10^8 components per cubic foot. These minute elements house the varied functions of rectifier, amplifier, resistor, and even inductor—with suitable external changes. The speaker presented slides depicting combinations of these transistors in various computer circuits—such as "half-adders" and "multipliers or gates." To the naked eye, these circuits are no larger than a fleck of dust.

Jenny cited the much-publicized "tunnel diode" as a step into the future for integrated electronics, since two or more transistors are required to duplicate its function. This device, which may see application as high as the millimeter wave region, advances the art because of the added sophistication of the combination of functions. It is apparent that the tube engineer of the future must be equally competent in circuits—no more branch currents and voltages, just transfer functions.

—Eugene W. Kinaman

MEETING REVIEW

Production-Planning Trio

Chairman Fanjul introduced the speakers of the evening at the PGPT meeting held in September. They talked on the production planning problems of

Olof Landeck

growing electronic firms in large, medium, and small categories.

The first speaker, W. McGinnity, manager of manufacturing planning at Ampex Corporation, outlined the system of building blocks which Ampex uses to cut down production lead time on system requirements. These building-block sub-assemblies are used in many of the systems which Ampex produces.

G. Eustachy, production manager at Beckman/Berkeley, discussed work-order processing, line leading, and follow up as it is applied at Beckman. The basic system of building-block manufacture for stock is also followed by Beckman/Berkeley. Both speakers stressed the importance of having a production forecast—pointing out that this was the key to their production-planning operations.

The third speaker, Olof Landeck, production manager at Electro Engineering Works, pointed out that his concern is required to operate without long-range production forecasts—that they work strictly from customer orders only some of which are long range. The solution to this problem at Electro is to use employees with wide skill ranges so it is possible to shift them to meet the changes in production requirements. Landeck discussed a production control system which is based on the Remington Rand Schedulegraph and showed some samples of the application of this system. A lively half hour of discussion followed the talks.

—George F. Reyling

MEETING REVIEW

An Evening With Ma Bell

Guest speaker for the mid-October meeting of PGEM was Lloyd Cornell, general engineering and construction supervisor of Pacific Telephone & Tele-

(Continued on page 16)

MORE PGEM

graph, whose subject was "Maintaining a Complex Communication Network." Cornell gave a thirty-minute talk supported by slides on maintenance of the Bell-System switching network. The American people make approximately 190 million telephone calls a day, 90 per cent switched by automatic dial systems, which in essence is a vast computer.

Maintenance of such a network is indeed a formidable task. Bell System, in order to solve this staggering maintenance problem, has organized what is probably one of the most efficient service and maintenance systems in the country. Cornell described the functional background of this service organization and also described in some detail the training techniques employed by the Bell System.

Following Cornell's talk, the group was taken on a conducted tour of a typical Bell-System dial office.

—W. S. Chaskin

MEETING REVIEW

Two for Telemetry

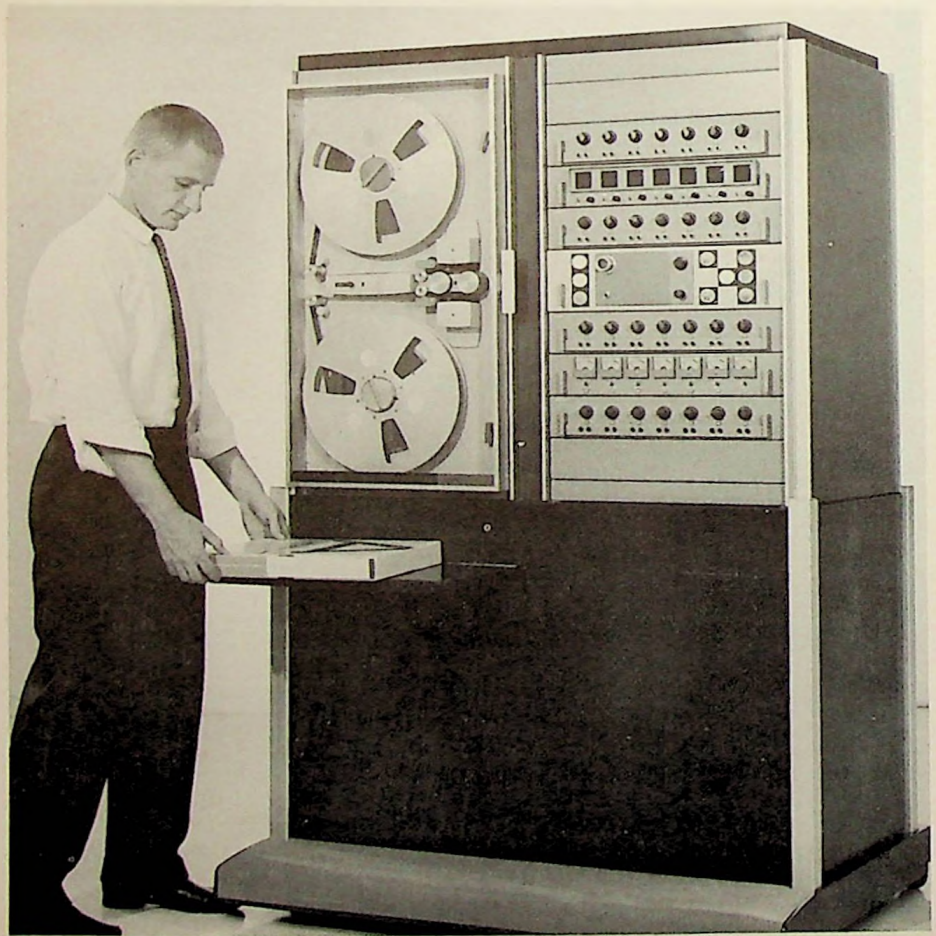
The October 20 meeting of PGSET was held in the auditorium of Lockheed Missiles and Space Division, Palo Alto. Robert B. Morgan presided.

The group was fortunate in having two speakers who dealt with related subjects. W. D. Collins, Jr., in his paper, "The DCS Heterodyne Telemetry System," described a technique employed by Data-Controls Systems, Inc., whereby two standard IRIG multiplexes can be transmitted over a single r-f link. A second system was described which employs the same basic heterodyne technique to permit the transmission of six channels each with the characteristics of IRIG Channel 14 to achieve a system with all channels of the same bandwidth.

In the second paper, Ken Thompson, applications engineer on the Carmel project of Ampex Corporation, described "A Wide-Band Analog Magnetic-Tape Recorder" with a frequency response capability extending to 250 kc. Since the DCS heterodyne telemetry system requires a base band of approximately this width, the recorder is ideally suited for use in ground stations employed with it. The electronic circuits of the recorder are completely solid state. The equipment has been designed from the human engineering standpoint and will accept either one-half inch or one inch wide tape.

The December meeting will be open to members' friends and families. The speaker will discuss a popular subject following the custom set last year.

—Robert B. Morgan



Ampex's new FR-600, one of the instruments discussed at the Oct. PGSET meeting

MEETING REVIEW

Traveling-Wave Masers

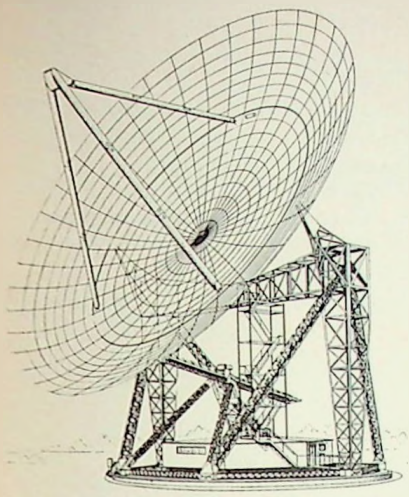
It was "back-to-school" time for Stanfordites, and so it was for a good many members of the PGED and PGMTT—at least for one evening late in September. The groups attended a lecture given by Professor A. E. Siegman of Stanford on traveling-wave masers, a subject which had long attracted his attention, and a review of the recent quantum electronics conference which he attended.

Basically, a traveling-wave maser is a slow-wave circuit contiguous to a piece of maser material, the whole assembly being inside a cavity or waveguide. Pump power is introduced to the container whereas the input and output terminals are the two ends of the slow-wave circuit.

Since the maser material has negative magnetic susceptibility, which is equivalent to a negative resistance in the circuit, the input signal will grow as it travels along the circuit, with a gain proportional to the ratio of the circuit length in free space wavelengths to the magnetic Q of the material, or the ratio of the velocity of light to the phase velocity (the slowing factor); a typical number at 3 kmc is 9 db per in. The traveling-wave maser has a relatively wide bandwidth ($\sim$1 per cent) which is limited by the line width of the material. The gain-bandwidth product is nearly a constant, as is well known, so broadening the bandwidth by smearing the line reduces the gain per unit length.

Besides its property as a negative resistant element, the material can be used for isolators and circulators, since it only responds to positively polarized components of the wave. But the biggest advantage is perhaps in its use as an amplifier, for it increases stability tremendously if properly arranged. Siegman reported a 25-db forward gain and 45-db backward attenuation in his "meander line" masers using ruby. The meander line, which may be thought of as a flat tape wound back on itself, is currently being used at Stanford and gives a high slowing factor over a wide frequency range.

After presentation of the theory, results on various masers were shown and Siegman summarized the advantages of a traveling-wave maser compared to a parametric amplifier as follows: broader bandwidth ($\sim$1 per cent); built-in non-



General scheme of the 142-foot radar telescope to be built at Stanford University shows a building at bottom center where its million-watt transmitter and instruments will be located. A joint project by scientists of Stanford Research Institute and of the University, the telescope will be used to explore the sun and planets by radar. With support from the Air Force Cambridge Research Center, the instrument will cost about $1.5 million and will be completed within a year

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reciprocity; possible electronic tuning; high saturation level, although this point is still debatable; low noise, (~15°K); and stability (this is the most significant feature of all) (a) against pump fluctuation, (b) against impedance mismatches, and (c) against aging, deterioration and burn-out.

Siegman then summarized some of the more interesting topics presented at the Quantum Electronic Conference held in September. Among the topics presented were: (1) the use of an ammonia maser as a time standard with an accuracy of 1 in 10^{11} (present accurock, 1 in 10^{10}; the absolute theoretical limit, 1 in 10^{13}), (2) optical pumping in masers, (3) investigations of relaxation processes in solid-state masers, and (4) other gaseous molecules in masers similar to the ammonia type for generating other frequencies. However, most of these are as yet only proposed schemes.

The Russian delegate attending the conference revealed that Russia started fairly late in the maser fields. Although they had thought of a three-level maser using gas, the results were not encouraging. They are, at the moment, seriously thinking about performing the Michaelson-Morley experiment using

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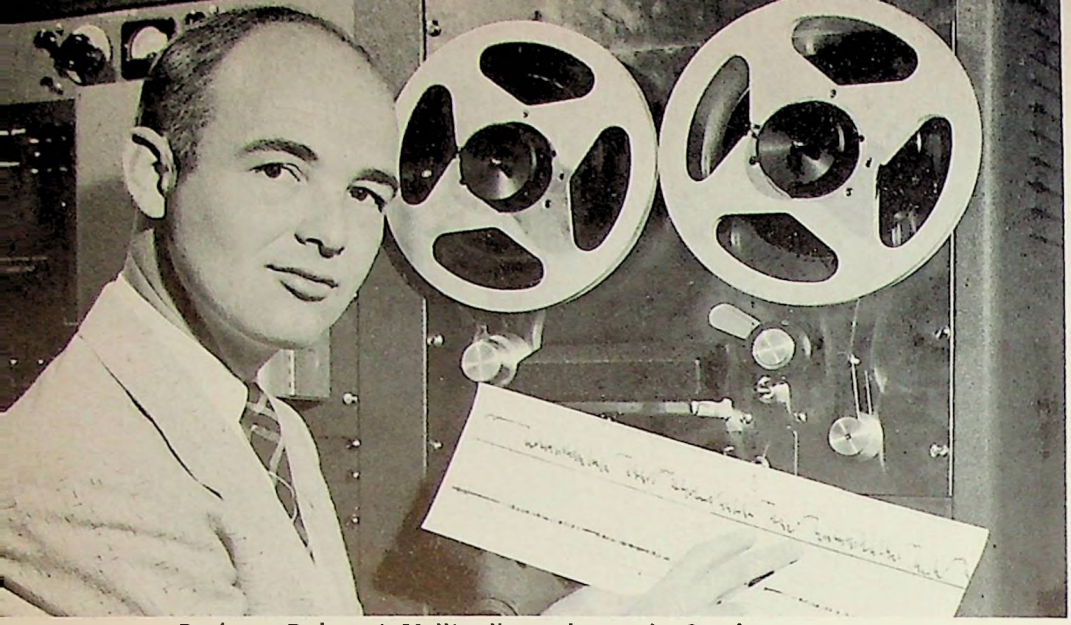


Professor Robert A. Helliwell, speaker at the October PGAP meeting, with a recording of some of his propagation data

MORE TRAVELING WAVE

masers. There seemed to be very little work done on solid-state masers in Russia, and none at all in traveling-wave masers.

A lively discussion period followed the extremely lucid and skillfully presented talk by Professor Siegman. Everyone attending seemed genuinely to feel they had learned a great deal about masers in a very short time.

—*Kungta Chow*

MEETING REVIEW

There's an Echo Out There

A Stanford experiment being conducted with apparatus on the paddlewheel satellite now in orbit was described by Professor Robert A. Helliwell in a mid-October meeting. The talk, open to the public, was sponsored by the Professional Group on Antennas and Propagation, IRE.

Under the title "A VLF Satellite Experiment," Helliwell described work testing his theory of a new concept of the distribution of ionized matter in outer space.

The question is, why is it that radio signals of very low frequency (vlf) are sometimes received at a distance from the transmitter, then seconds later are received again? It would seem that the signals took two different paths to the same place, one path considerably longer than the other.

One explanation for this behavior was suggested by Helliwell. He postulates that while most vlf waves are reflected back to earth by the ionosphere, some of the signals manage to penetrate this barrier and head out into space. He then suggests that a series of arcs or ducts of ionized matter arch outward high above the ionosphere—but still along the earth's magnetic field—and then return to the earth's surface again. Such ducts would make excellent conductors of the escaped vlf signals, bringing the signals down to earth again many thousands of miles from the transmitter. Because these signals took the "high road," they would arrive some time after those coming more directly on the "low road" below the ionosphere.

If these ducts exist, and if their dimensions and paths can be determined, then they might be deliberately utilized to study radio propagation and ionization characteristics in the vast regions above the ionosphere.

Under sponsorship of the National Aeronautics and Space Administration, Helliwell's theory is being checked out with a specially developed radio receiver carried in the paddlewheel satellite. The receiver, designed and constructed by SRI's Louis H. Rorden and Robert N. Beatie of Develco, Inc., is extremely sensitive and is the first vlf receiver ever placed beyond the ionosphere.

A Navy transmitter at Annapolis sends out vlf signals at 15.5 kc, and if any do go beyond the ionosphere and follow the conducting pathways, they will be received in the satellite as it crosses any given ionized path. Telemetering equipment will then relay the signals to the ground. As the satellite crosses the ducts at different points on each of its journeys around the earth, it should be possible to determine a great deal concerning the location, size, and shape of the ducts.

Helliwell is professor of electrical engineering and a member of the Radio Propagation Laboratory staff at Stanford. He received his AB degree in electrical engineering from Stanford University in 1942. He then took charge of Stanford's program of ionospheric measurements and research aimed at improving wartime communications. This was later augmented by studies of high-frequency direction finder errors over long-range paths. During this period he continued with part-time graduate work. He received his AM and EE degrees in 1942 and 1944, respectively.

Following the war he began studies of low-frequency propagation, including development of a new technique for making high-resolution virtual height measurements. Polarization data were obtained, and formed the basis for a dissertation for which he received his PhD degree from Stanford in 1948. In 1951 Helliwell began a program of research into the nature of "whistlers" and related very-low-frequency phenomena, which is yielding new results of importance to wave propagation and ionospheric physics. He was in charge of a program of synoptic whistler measurements for the International Geophysical Year, and has authored and co-authored many technical papers dealing with ionospheric wave propagation.

—*E. A. Blasi*

MEETING REVIEW

Fourth Estate

On October 26 the **Grid** staff and the Publications Board of the San Francisco Section held a joint meeting for the purpose of familiarizing this year's new reporters with the operational procedures of **Grid** production.

Beginning with a tour through Peninsula Lithograph Company's plant in Redwood City, where the **Grid** is produced, the event continued with a social gathering and dinner at Scotty Campbell's restaurant, followed by a round-table discussion of the Section's publishing routines.

Old Publications

Through various complicated circumstances, the **Grid** editorial office has accumulated a rather astonishing bulk of back numbers of technical publications. These range from "Electronics" and "Proceedings" through the physics journals, the aero/space publications, even to some of the chemical books.

Nowadays, even the Boy Scout paper drives will not touch this kind of stuff. However, if you have some gaps in your library and are within convenient striking distance of San Mateo, get in touch. We will make an appointment for you to scavenge through the collection.

MEETING REVIEW

The Tunnel of Esaki

The quantum mechanical tunneling effect from which this new semi-conductor device derives its name has been known for some 30 years as the underlying process in radioactive decay, in field emission, and in Zener diodes. The Zener voltage is the reverse breakdown voltage in highly doped P-N junctions and it is a function of the resistivity.

About two years ago Esaki studied the characteristics of these devices as he reduced the resistivity to very low values. At a resistivity of about 0.001 ohm per cm the Zener voltage became almost zero. As the resistivity was reduced still further he observed the remarkable forward characteristic of the tunnel diode which exhibits a negative resistance for a small range of forward applied voltage.

Esaki realized that this new effect could be explained out of the already existing theory of the Zener diode. In fact, as stated by Dr. Herbert Kromer in his presentation at the October PGMTT meeting, the effect could have been predicted years ago if only someone had put positive voltage numbers in the equations.

In describing the process, Kromer likened the tunneling of electrons across a junction to the penetration of microwave fields into a cut-off waveguide according to an exponential law. In the tunnel diode at zero bias there is an overlapping in energy between the top of the P region valence band and the bottom of the N region conduction band and electrons can tunnel across the potential barrier to an unoccupied state of equal energy on the opposite side provided the barrier width is sufficiently small and the electric field intensity in the barrier region is sufficiently high.

Herbert Kromer

The probability for this to occur is

$$T = \exp(-4/3 \times 2m^{1/2}/h \times Eg^{3/2}/eE$$

where Eg is the band gap.

E is the (uniform) electric field in the barrier

m is the effective mass of the electron

e is the electron charge

h is Planck's constant

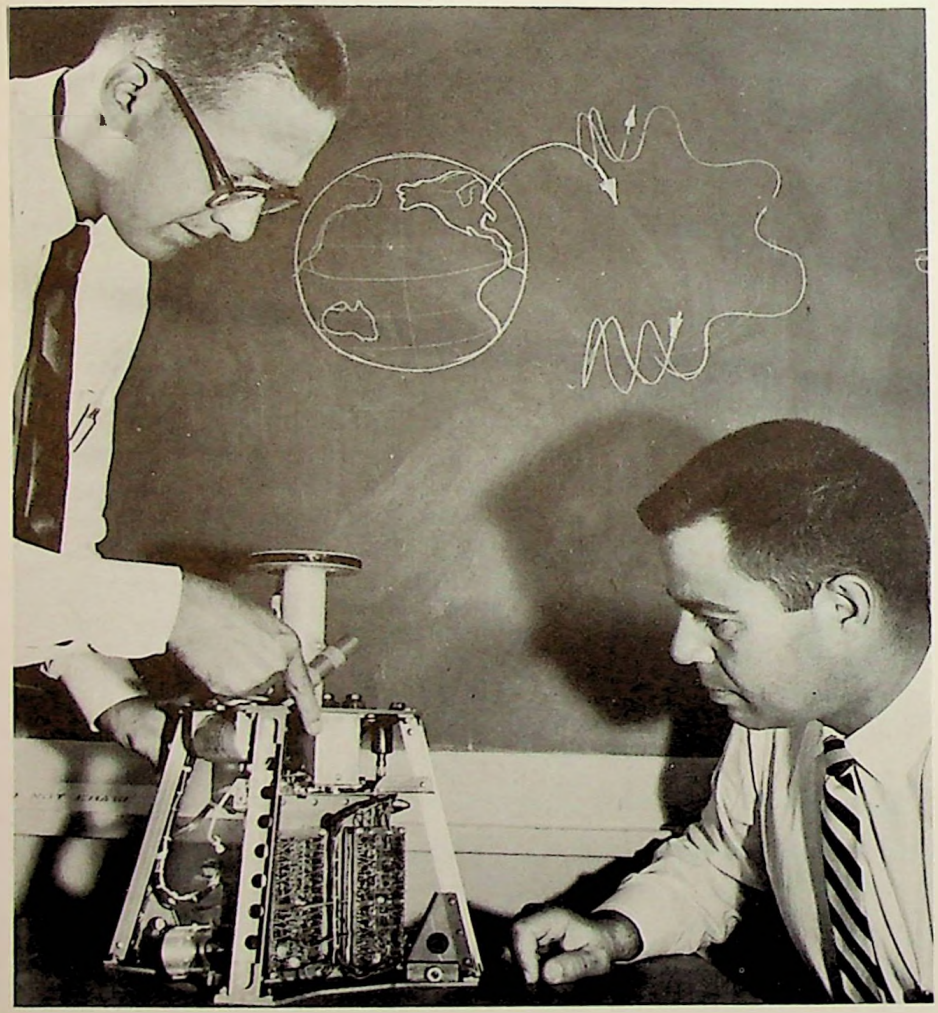
To demonstrate the critical dependency on the electric field the following figures were quoted by Kromer. For $E=2 \times 10^5$ volts per cm, the tunneling current is 1 electron per 10^9 years while for $E=2 \times 10^6$ volts per cm the tunneling current is 1 electron per tenth microsecond.

To produce the high field at zero bias the junction width has to be of the order of 100 angstroms (10^{-6} cm). At zero bias the tunneling current across the barrier is equal in both directions. As a small forward voltage is applied the electron flow from the N side to the P side is larger than the reverse flow and the external current rises. As forward voltage is increased the external current reaches a peak and then starts to decrease because overlapping of the bands and hence the tunneling current is being reduced.

Tunneling current reaches zero (as voltage is increased further) when the bands no longer overlap and the external current is now a minimum. At this point, however, the diode behaves as a normal P-N junction with diffusion current flowing and further increase in voltage results in an exponential increase in external current compatible with the normal P-N diode. One of the mysteries of the tunnel diode is the minimum current at the valley of the V-I curve which is much larger than theory predicts.

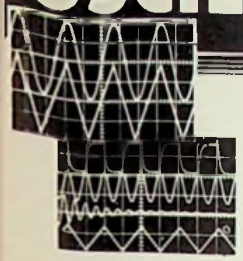
Kromer went on to describe the basic characteristics of the tunnel diode as a

(Continued on page 22)



Dr. Martin Walt and Dr. John Cladis of Lockheed inspect the instrumentation package developed for Operation Javelin, the Air Force program to measure radiation in the Van Allen belt. The Lockheed-designed instrument unit, containing scintillators and other precision measuring equipment, weighs 15 pounds and is tailored to fit in the nose cone of specially developed rockets. At altitude, the nose cone is popped off, and the instruments telemeter their readings to recording equipment on the ground

DC-to-25 MC DUAL-BEAM OSCILLOSCOPE



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Jerome Russell and Chairman Donald Pederson attend to the needs of the inner man following the October EBSS meeting —Hugh Gray photo

MORE TUNNEL

circuit element. Since the barrier region is only 100 angstroms thick the capacitance is of the order of 1.6 μf per square cm. The negative resistance region of the V-I curve is approximately 0.1 volt wide on the V axis and this is pretty well fixed when the various parameters of the diode are varied. The peak current density which depends on the doping determines the magnitude of the negative resistance. A small change in the doping results in a large change in the negative resistance. If J is the peak current density (amp per sq cm), A is the area (sq cm), the impedance of the circuit is of the order of the negative resistance $R = 0.1/JA$ (ohms). The capacitance $C = 1.6\ A$ (μf). The maximum usable frequency is of the order of $f = 1/RC = 6 \times 10^{6}\ J$. The power $W = (0.1)^2/2R = JA/20$. For a frequency of 10,000 mc and an impedance of 50 ohms the area would have to be 10^{-6} sq cm and the power would be only 100 microwatts. For a power of 1 watt and a frequency of 10,000 mc the area would have to be approximately 1 sq mm and the impedance would be 0.005 ohms.

The important message for high-frequency-circuit designers is that the fate of the tunnel diode depends on the development of very low impedance circuitry, not to mention its adaption as a bilateral element.

In conclusion, Kromer pointed out some of the possibilities for improving the present diodes. The current at the valley of the V-I curve which produces shot noise is still of unknown origin and further research may lead to an improvement here. Better materials are being investigated. Those suitable for transistors are really not suitable for tunnel diodes. This is because the tunneling effect does not depend on minority carrier lifetime as is the case with the diffusion process. Although the tunnel diode is certainly here to stay, Kromer felt that it may be only the first in a new class of devices yet to come.

During the question period following the lecture, Dr. Heffner pointed out that the theoretical noise figure of an amplifier is dependent upon the product of the current at the operating point and the negative resistance magnitude. With the present diodes this product can't be changed very much because of the valley current. He estimated the minimum possible noise figure to be 3 db.

—J. K. Hunton

MEETING REVIEW

Bubble, Bubble

Jerome Russell, group leader, Lawrence Radiation Laboratory, Berkeley, spoke on "High-Speed Data Reduction" before the East Bay Subsection early in October. Thirty-five attended the preliminary dinner and fifty-two the meeting itself.

Russell has charge of a group doing engineering support for experimentation in the 72-in hydrogen bubble chamber at the laboratory. This particular assignment has involved the design of a high-speed digital computer to reduce data from the experiments. Typically, an experiment will involve measurement of the 150,000 stereo triplet photos of particle tracks which are produced.

Russell discussed many of the transistor logic circuits used in the computer and also covered memory devices. The meeting was concluded by the serving of refreshments.

—Eugene A. Aas

TNSEWS

Those Reports

Current practices in the submission of periodic technical reports required by government agencies from their contractors were criticized recently by Dr. Charles Susskind, associate professor of electrical engineering at the University of California in Berkeley.

Professor Susskind proposed a new system for submitting such reports in

Nearing completion at Rancho Arroyo Seco just outside Monterey is a 60-ft parabolic antenna on an azimuth-elevation mount. It will be the first functioning element of the advanced engineering division of D. S. Kennedy Inc., formerly Satellite-Kennedy. The antenna and related facilities will be made available to outside organizations for propagation studies. Robert J. Grenzeback, vice president for advanced engineering, will have charge of the antenna range. Howard H. Hubbard is chief engineer

Charles Susskind

his address before the Third National Symposium held at the Ambassador Hotel in Los Angeles on September 17-18, 1959, by the Professional Group on Engineering Writing and Speech of the Institute of Radio Engineers.

"The requirements as to format, length, content and frequency differ from agency to agency, and sometimes from contract to contract within a single agency," Dr. Susskind declared. "Organizations with several prime contracts, such as university and other research laboratories, can hardly keep up with the various deadlines for reports, which may fall due monthly, bimonthly, quarterly, or at other intervals peculiar to a specific contract," he added.

Dr. Susskind, a well-known electronics specialist and educator, has been interested in technical writing ever since his student days at Cal Tech, where he worked as a part-time editor in the Jet Propulsion Laboratory. He is the author of a recently published "Dictionary of Style" for technical reports, a concise handbook for writers, editors, and typists that lists preferred practices alphabetically.

"I have no quarrel with the requirement for a final technical or scientific report that many government agencies request at the end of a contract or project," Dr. Susskind said. "Unfortunately, most of them also require periodic progress or status reports during the life of the contract, and that's where the trouble begins," he warned.

"Depending on the contract and on its starting date, one periodic report or another may fall due almost every other week in even small firms or institutions. Their technical staffs then find themselves spending much valuable time on the preparation of such reports.

(Continued on page 24)

Alan T. Waterman, Jr., chairman, PGCS

Kenneth P. Patterson, vice chairman, PGCS

ELECTION NEWS

Professional Group on Communications Systems

Alan T. Waterman, Jr., Stanford University, chairman. An associate professor of electrical engineering, Waterman is also associate director of the systems-techniques laboratory and a consultant to the weapons-systems evaluation group of the Department of Defense, and to local industrial concerns.

Recipient of an AB in physics from Princeton University, a BS in meteorology from the California Institute of Technology, and an AM and PhD in engineering sciences and applied physics from Harvard University, his memberships include American Meteorological Society, American Association for the Advancement of Science, and Sigma Xi. He is a senior member of IRE.

His previous activities include research at Harvard, the University of Texas, Columbia University, and the California Institute of Technology. He has been an instructor in meteorology at the University of Minnesota and a meteorologist for American Airlines.

Kenneth P. Patterson, Sperry Gyroscope Company, vice chairman. Patterson is a senior development engineer in the astrononautics department at Sperry and is currently concerned with microwave equipment.

His eighteen years of experience in the development of equipment and in systems planning and analysis was largely with the Signal Corps prior to his association with Sperry. This experience includes several years of analysis of foreign electronic techniques for military intelligence.

He received his technical education by various courses at the University of California, Stanford University, and the University of Virginia. He also holds memberships in the PGEM and the PGMIL.

MORE REPORTS

"Copies of each report are then mailed to a long distribution list — sometimes nearly the same list as for another contract. Yet it is very difficult for an interested reader to find out the current status of a specific project going on elsewhere unless he knows at least the contract number and sponsoring agency," he explained.

Under the revised system proposed by Susskind, each contractor organization would prepare four periodic reports annually, one at the end of each quarter of the calendar year. Progress on all "unclassified" work in a broad field, such as metallurgy, biophysics, or electronics, would be reported in this single publication, regardless of the contract's starting date, number, or sponsor.

Distribution would be greatly simplified. So would what computer specialists call "information storage and retrieval"—that is, getting full information quickly on a topic about which you know very little, and sometimes no more than that it exists.

R. A. Isberg, secretary-treasurer, PGCS

MORE ELECTION

R. A. (Al) Isberg, Ampex Corporation, secretary - treasurer. Al is a registered professional engineer specializing in broadcasting, television, and microwave communications. As senior engineer in the contract engineering section of Ampex Professional Products Company, he is engaged in the development of high-speed magnetic-tape duplicating equipment.

He has served the San Francisco Section of the IRE as secretary, vice chairman, and chairman (1949-1951), and has been secretary and vice chairman of the San Francisco Engineering Council (1950-52). He has also served as secretary and chairman of the San Francisco Section of the Society of Motion Picture and Television Engineers (1956-1957).

He was formerly chief engineer of KRON-TV and KRON-FM (1946-1951), and was lead engineer in the systems and controls section of the California Research and Development Company (1951-1952) which was then engaged in linear accelerator development. During World War II, he was a senior project engineer at the airborne instruments laboratory of the Columbia University division of war research.

He graduated from Colorado State College in 1935 and received an AB degree in physical science. He is a Senior Member of the Institute.

Professional Group on Military Electronics

Major Otis R. Hill, USAF, chairman. Major Hill is presently chief, ARDC office, San Francisco Bay Area. He obtained his bachelor of science degree at Purdue University with an interlude as aircraft commander of the 380th

(Continued on page 26)

Major Otis Hill, chairman, PGMIL

Louis Gado, vice chairman, PGMIL

L. R. Law, secretary, PGMIL

MORE ELECTION

Bomber Group.

Subsequently, he completed assignments with SAC and the Atomic Energy Commission. He was active in the atomic energy program and participated in four nuclear bomb test operations and assembly and arming of 17 nuclear drops.

More recently he served as chief of the test instrumentation development branch of ARDC and as a member of the inter-range instrumentation steering committee and telemetry working group of the same organization.

Louis G. Gado, Wiancko Engineering Co., vice chairman. Born at Clifton, New Jersey, and educated in the West New York, N. J., public schools, Gado obtained his AB in physical sciences at San Jose State in 1950.

Prior to this, he had been an engineering aide in the Signal Corps laboratories at Fort Monmouth, N. J., and a radar technician in the U. S. Marine Corps. Between 1949 and 1957, he held numerous posts in the systems development section at the U. S. Naval ordnance test station and was vice chairman of the China Lake Section, IRE. Since 1957, he has been a field engineer with Wiancko Engineering Co. in Palo Alto.

L. R. Law, Lockheed, secretary. Law is a supervisor of reliability evaluation in the missiles and space division. Prior to joining Lockheed in 1957, he was with Bendix Aviation Corporation's Pacific division, with Electronic Engineering Co. of California, with West Coast Electronics, Law Sound Systems and TV, and the California Institute of Technology. He has also been a high-school teacher of physics, general science, and chemistry.

His educational activities include the receipt of a bachelor of science degree from Oklahoma State University, majoring in physics, and studies in psychology at New Mexico State Teachers College. Besides PGMIL he is a member of the Professional Group on Engineering Management.

Walter J. Prise, Lockheed, treasurer. Possessor of a BSEE from the University of California, Prise has also done graduate work there. He has been assistant chief electrical engineer at Moore Dry Dock, has worked on radar development at Raytheon Mfg. Co., has been active in the design and installation of Texas-Tower early radar warning equipment with Consolidated Copper & Steel Industries, and has been chief engineer of the Maintenance Company in New York City.

Presently he is a production design specialist in the Lockheed Missiles and Space Division at Sunnyvale having gone to Lockheed from Kaiser Engineers where he was on the consulting staff. He has also been a consulting editor for McGraw-Hill Publishing Company.

He is a member of AIEE.

(Continued on page 28)

Walter P. Prise, treasurer, PGMIL

MORE ELECTION

Professional Group on Reliability & Quality Control

C. Bruce Clark, chairman, PGRQC

C. Bruce Clark, Stanford Research Institute, chairman. Born in Calistoga, California, in 1919, Clark attended the University of California at Berkeley, graduating with a BS degree in electrical engineering in 1942. From 1942 until 1945, he was employed in radar countermeasures work at the radio research laboratory, Harvard University.

After the war, Clark was employed as research engineer at the radiation laboratory, University of California; and the electronics research laboratory at Stanford University. He joined Stanford Research Institute in 1952, where he is now a senior research engineer.

Robert A. Davis, Philco, vice chairman. Davis is a group engineer in the reliability group at Philco's Western Development Lab.

In this post, he directs analytical studies of systems and components for prediction of reliability, performs sys-

Robert A. Davis, vice chairman, PGRQC

Julian Hilman, secretary-treasurer, PGRQC

tem-analysis studies, and designs experiments for component evaluation.

His former employment included Lockheed, Jet Propulsion Laboratory, and Western Electric Co.; his education, AB in physics, Friends University, Wichita, Kansas, and graduate work in physics at Iowa State University, Ames.

He holds membership in the Operations Research Society of America and the Human Factors Society of America.

Julian Hilman, Fairchild Semiconductor Corporation, secretary-treasurer. Hilman is manager of the reliability-evaluation division at Fairchild. He holds a BSEE from Pennsylvania State University and an MSEE from San Jose State College where he is presently enrolled.

Previous experience includes work on the analysis of sound and vibration in submarine detection systems at the Tay-

(Continued on page 38)

John Hall, program chairman, PGRQC

GRID SWINGS

It Is Reported That:

Whinnery

Dr. **John R. Whinnery,** Fellow, IRE, professor of electrical engineering, has been appointed Dean of the College of Engineering on the Berkeley campus of the **University of California.** He succeeds **Dean Morrough P. O'Brien,** who retired from the position on June 30 after 15 years as head of the College.

In his new position, Whinnery will be responsible for the education of the 1809 undergraduates and 589 graduate students enrolled in engineering at Berkeley during the current semester. As an example of the growth of the College in recent years, comparable enrollment figures for 1953 were 1415 and 199.

Whinnery, 43, moves to his new position after three years as chairman of the department of electrical engineering at Berkeley. He received the BS degree on the Berkeley campus in 1937 and then spent the following nine years performing research in microwave electronics with the General Electric Co.

In 1946, he returned to the Berkeley campus and obtained his doctorate there two years later. His faculty appointments at Berkeley have included lecturer in 1946, associate professor in 1948, and professor of electrical engineering in 1952.

In 1951-52, Dean Whinnery took a leave of absence from the University to serve as head of microwave tube research for the Hughes Aircraft Co. During the 1958-59 academic year he studied noise problems in microwave tubes at the Swiss Federal Technical Institute on a Guggenheim Fellowship.

Rushforth

Paul

Knewel Rushforth has joined **Dalmo Victor Company** as manager of the newly established applications engineering department in the Belmont firm's electronic systems division.

Robert S. Paul is manager of **Melabs'** expanding production department in Palo Alto. Paul went to Melabs from Lenkurt Electric Company, San Carlos, where he spent the past 13 years and held the position of manager of the production planning and scheduling department.

The Space Communications Division of **Radiation, Inc.,** Mountain View, has been selected by Lockheed Missiles and Space Division to assist in the design and development of a unique master control center for monitoring satellite flights. The control center will continuously receive and evaluate data from the orbiting satellite; receive information direct from all tracking equipment around the world; command this same equipment; receive corrections and program data to the satellite; plot world-wide weather, satellite locations and altitude; and keep track of the status of all world-wide tracking equipment. In addition to these complex computing tasks, the center will also relay mes-

(Continued on page 32)

MORE ELECTION

ar Model Basin and Johnsville Naval Air Development Center as well as transistor-reliability activities at Remington Rand Univac and American Bosch Arma.

Society memberships include the American Institute of Electrical Engineers and the American Society for Quality Control.

John Hall, Dalmo Victor Company, program chairman. Group leader in engineering reliability at Dalmo, Hall is a graduate of the University of California, holding a BSEE.

Formerly he was an electronic designer at Boeing Airplane Company in the pilotless-aircraft division working on Bomarc equipment where he organized an engineering-reliability group for the weapon-system program.

NEW BYLAWS

Engineering Management

Dated October 22, 1959, is a new set of bylaws for the San Francisco Chapter of PGEM. Containing eleven articles and running four and a half pages of single-spaced copy, the new document has been approved by the executive committee.

Wyand

Jatras

MORE SWINGS

sages via closed circuit TV to the Vandenburg Air Force Base blockhouse.

David L. Wyand has been appointed manager of customer services at **Eitel-McCullough, Inc.,** San Carlos. Wyand was a member of the government marketing department prior to this recent promotion. Prior to joining the marketing division at Eimac, Wyand served as a field engineer for the Westinghouse Electric Corporation in Baltimore.

Appointment of **Stephen J. Jatras** as director of engineering of the **Lockheed** Electronics and Avionics Division (LEAD), Los Angeles, has been announced. Jatras joined Lockheed in 1956 as a staff scientist in the Missiles and Space Division, served that division as business administrator for the research branch and manager of the flight controls and guidance division before becoming assistant to the director of research.

Dr. **Jerome R. Singer,** associate professor of electrical engineering at the University of California, Berkeley, is the author of "Masers," a new book published by John Wiley and Sons.

Edward C. Buurma, formerly manager of product development of **Sequoia Wire and Cable Company,** has been transferred to the parent company, Anaconda Wire and Cable Company.

McCarthy Associates has been appointed representatives for Houston Instrument Corp., (precision instruments); Daytronic Corp., (differential transformers and instrumentation systems); and Larson Instrument Co., (time recorders and transistorized contact meters). A new field engineer, **Ron Rasmussen,** formerly with Sierra Electric Corp., has been attached to the Menlo Park office.

At **Knapic Electro-Physics, Inc., Robert D. Yeaman** becomes vice president of manufacturing and engineering and **George M. MacLeod,** vice president of sales.

Advanced Instrument Corporation has announced its entry into the digital data handling field. The new firm will carry on the work of Cyber-X Instrument Company, a proprietorship of **Ralph L. Fenner,** which developed the basic equipment over the last three years. ADVINCO will continue business at 1740 University Avenue in Berkeley, California. Business manager is **Elwyn (Steve) Evans, Jr.,** who has been head of Evans Electronics and Chattin Engineering Associates in Oakland. **Robert E. Krueger** is in charge of sales; he was formerly sales manager at Shand and Jurs, Donner Scientific, and Unitek Corporation (Weldmatic Division). Chief engineer is **Jack S. Hawley,** also formerly with Shand and Jurs and with Granberg Corporation as chief engineer.

The most intense source of X-radiation in the world is located in the research laboratories of Shell Development Company in Emeryville, according to **C. D. Wagner** and **V. A. Campanile,** writing in **Nucleonics.**

Phil H. Rogers has joined the Cedar Rapids division of Collins Radio Company as assistant director of research. He previously worked at the Sylvania Electronics Defense Laboratory.

Batdorf

Munger

Appointment of Dr. **Samuel B. Batdorf** as director of research for the Lockheed Electronics and Avionics Division (LEAD) has been announced. Batdorf currently is on leave from the Lockheed Missiles and Space Division.

Appointment of **James C. Munger** to the position of manager of product planning for **Sylvania's** special tube operations has been announced. Munger joined Sylvania in 1950 at Emporium, Pa., as a tube-applications engineer. He later transferred to the electronic tube sales department as a sales engineer working out of the Los Angeles office.

Ampex Corporation now conducts its domestic business through five integrated companies, one of which is the newly created **Ampex Professional Products Company. Ampex Data Products Company** also was established on November 1, 1959. The three previously existing companies include **Ampex Audio, Inc., Ampex Military Products Company** and **Orr Industries.** The latter (Orr Industries) was merged with Ampex Corporation on October 7. Ampex Corporation conducts its foreign operations through Ampex International, a group of subsidiaries organized specifically for foreign marketing, manufacturing and engineering.

Thomas E. Davis, formerly marketing manager of Ampex's professional products division, has been named manager of the video products division of Ampex Professional Products Company. **Frank G. Lennert** will head the audio products division as manager.

In addition to Davis and Lennert, heads of other divisions of Ampex Professional Products Company will report directly to **Neal K. McNaughten,** manager. They are **Arthur Kromer** (manufacturing) and **William Rolly** (quality control).

The new **Stanford Hospital** has an experimental six-foot linear accelerator for cancer treatment and an x-ray machine which can take a continuous picture of the entire length of the body at any desired level.

(Continued on page 34)

Hoagland

Anderson

MORE SWINGS

Dr. **Albert S. Hoagland** has been appointed manager of engineering sciences research at the San Jose research laboratory of the **International Business Machines Corporation**. In January of this year he was appointed senior research engineer and given responsibility for large-scale memory research. Dr. **Arthur G. Anderson** has been appointed manager of physical science research. He has been acting manager of the physics and chemistry research group at the San Jose laboratory.

Editorial Associates, Los Altos, announces that its technical editing and illustration services are available for the preparation of book manuscripts and reports in the physical sciences and engineering. **Emlen Littell,** head of the new firm, was until recently a supervisory editor in research technical publications, Lockheed Missiles and Space Division. Associated with him is **Gertrude Taylor Smith,** former director of publications division, U. S. Naval Civil Engineering Research and Evaluation Laboratory.

Frank F. Davis has joined **Carl Herrmann Associates,** technical representatives, in their Palo Alto office. Prior to joining Herrmann, Davis was manager of applications engineering at Consolidated Electrodynamics.

Richard L. Paullus, manager of the Western Electronic Manufacturers Association (WEMA), has been appointed electronics research officer, Electronics Investment Management Corporation, effective January 1, 1960. In the past, Paullus has been with Boeing Airplane Company in Seattle. He received a BS from the University of Southern California in 1952.

Paullus

Davis

Electronic Measurements Company Inc. is represented by **John Francis O'Halloran & Associates,** Palo Alto.

Appointment of **Thomas W. Wilder III** as director of data-systems research at **Broadview Research Corporation** has been announced. Wilder has gone to Broadview from Lockheed Missiles and Space Division.

Howard Katzman has joined **Granger Associates** to become project manager in the firm's countermeasures and transmitter-development program. From 1955 until joining Granger, Katzman was employed by Lockheed Missiles and Space Division. He has BS and MS degrees in electrical engineering from Newark College of Engineering.

Automation Instruments, Inc., whose home offices are in Manhattan Beach, has announced the appointment of **Charles W. Jobbins** to the position of corporate technical advisor. Jobbins was formerly president of Jobbins Electronics in Menlo Park, which is being acquired by Automation Instruments in an exchange of stock. **Hoyt E. "Duke" Wilcoxon** is general manager of the magnetics division, composed of two plants, one located at Boulder, Colorado, and the other, Jobbins Electronics of Menlo Park, California. Wilcoxon will divide his time between the two plants.

The annual search has begun for the amateur radio operator who performed the most outstanding public service during 1959. Nominations are now open for General Electric's Edison Radio Amateur Award—and this year candidates will be sought in the new states of Alaska and Hawaii as well as in the continental states.

Henry Bollwinkel, president of **Gilliland Instruments Company** of Oakland, has announced the formation of a joint enterprise with **Nuclear Research Instruments** of San Francisco. The two companies will produce Franckenstein measuring projectors for major atomic research laboratories under the name of Gilliland-NRI.

Applied Electronics Company, Inc., South San Francisco, announces that **Murray Baird** and **E. M. Bradford** have joined their engineering staff. Baird, formerly senior engineer of Gonset Division, Young Spring & Wire Corporation, Burbank, has assumed the duties of assistant chief engineer, and Bradford, who was plant superintendent of Kaar Engineering Company of Palo Alto, will fill the newly created position of liaison engineer.

EVENTS OF INTEREST

Meetings Summary

November 19—**Golden Gate Section of the Society of Plastics Engineers.** Claremont Hotel, Berkeley, Calif.

November 19-20—**Professional Group on Nuclear Science, Sixth National Meeting.** Boston Commonwealth Armory, 925 Commonwealth Ave., Boston, Mass. Hugh F. Stoddart, Atomium Corp., 940 Main St., Waltham 54, Mass.

December 1-3—**Eastern Joint Computer Conference.** Statler Hotel, Boston, Mass. Jean H. Felker, Bell Telephone Labs., Murray Hill, N.J.

December 1-2—**Fourth Midwest Symposium on Circuit Theory.** Brooks Memorial Union, Marquette University, Milwaukee, Wisconsin. James D. Graham, College of Engineering, Marquette University, Milwaukee, Wis.

December 2-4—**Electronic Industries Association Meeting.** Statler-Hilton Hotel, Los Angeles, Calif.

December 3-4—**Professional Group on Vehicular Communications Annual Meeting.** Colonial Inn and Desert Ranch, St. Petersburg, Florida. J. R. Neubauer, RCA, Bldg. 1-4, Camden 2, N.J.

Papers Calls

January 1 — Title and abstract of paper for the Eighth Weather Radar Conference (April 11-14, 1960, San Francisco). Send to: Myron G. H. Ligda, Stanford Research Institute, Menlo Park, Calif.

February 1 — 250-word unclassified abstract presenting original work in military electronics for Fourth National Convention on Military Electronics (June 27-29, 1960, Sheraton-Park Hotel, Washington, D.C.). Send to: Craig M. Crenshaw, Department of Army, Office of the Chief Signal Officer, R & D Division, SIGRD-2, Washington 25, D.C.

CAPACITANCE

Sliced Ever Finer

According to General Radio Co., "In the measurement of small capacitors, connection errors of the order of a few tenths of a picofarad often obtain.

"As capacitance measurements and standards move forward toward the millionth part of the millionth part of the millionth part of the farad (10^{-18}), it has become increasingly advantageous to follow the lead of the National Bureau of Standards, and others in calling 10^{-12} farad a picofarad instead of a micromicrofarad, and to indicate the abbreviated abbreviations 1 pf instead of 1 $\mu\mu$f for 10^{-12} farad and 1 μpf instead of 1 $\mu\mu\mu$f for 10^{-18} farad."

MANUFACTURERS INDEX

Manufacturer	Representative
Ace Engineering & Mch. Co.	Premmco, Inc.
Accurate Instrument Co.	Jay Stone & Assoc.
Advance Components, Ltd.	Hugh Gray Company
Alfred Electronics	White and Company
Alto Scientific Co.	Long & Associates
Ameray-Nuclear Shielding Prod. Div.	White & Co.
American Mach. & Fdry.	McCarthy Assoc.
Antlab, Inc.	Jay Stone & Assoc.
B & F Instruments	Hugh Gray Company
Behlman Engineering Co.	T. Louis Snitzer Co.
Bendix Aviation–Cincinnati Div.	Hugh Gray Co.
Beta Electric Co.	McCarthy Associates
Bogart Microwave	Jay Stone & Assoc.
Boonton Electronic Products, Inc.	O'Halloran Assoc.
Budd-Stanley, Inc.	Hugh Gray Co.
C and H Supply Company	Jess W. Coffer
Callite-Tungsten Corp.	Jack Kaufman
Circo Ultrasonic Corp.	Hugh Gray Company
Consolidated Avionics Pwr. Sup. Inc.	Long & Assoc.
Data Instr., Tele.	T. Louis Snitzer Co.
Del Electronics Corp.	Hugh Gray Company
Di/An Controls, Inc.	Jay Stone & Assoc.
Dymec, Inc.	Neely Enterprises
Electro-Measurements	Neely Enterprises
Electro-Pulse, Inc.	T. Louis Snitzer Co.
Electro Switch Corp.	Jack Kaufman
Electronic Measurements Co.	O'Halloran Assoc.
Electronic Mechanics Inc.	Jack Kaufman
ELMEG (Presin Co.)	White and Co.
Emerson & Cuming	McCarthy Assoc.
EMI-Electronics, Ltd.	White & Company
Empire Devices Products	White and Company
John Fluke Mfg. Co.	McCarthy Assoc.
Franklin Electronics, Inc.	T. Louis Snitzer Co.
General Communication	T. Louis Snitzer Co.
Glass-Tite Industries	Jay Stone & Assoc.
Globe Industries	Long & Associates
Hamner Electronics	McCarthy Assoc.
Hewlett-Packard	Neely Enterprises
Heli-Coil Corp.	Premmco, Inc.
Huggins Laboratories, Inc.	T. Louis Snitzer Co.
Hughes Products Co.	McCarthy Assoc.
Hyten Company	Hugh Gray Company
IVO (Presin Co.)	White and Co.
Kauke and Co., Inc.	Jay Stone & Assoc.
Keithley Instruments	T. Louis Snitzer Co.
Kin Tel	Neely Enterprises
Lamtex Industries	Jack Kaufman
Leach Relay Division	Jack Kaufman
LEL, Inc.	White and Company
Levinthal Electronic Nuclear Div.	White and Co.
Levinthal Electronic Equip. Div.	O'Halloran Assoc.
Lindsay Structures	Premmco, Inc.
Manson Laboratories, Inc.	White and Co.
Massa Div., Cohu Electronics	McCarthy Assoc.
Menlo Park Engineering	O'Halloran Assoc.
Millivac Instrument Div., Cohu	McCarthy Assoc.
Narda Microwave Corp.	O'Halloran Assoc.
New London Instrument Co.	Hugh Gray Company
Oregon Electronic Mfg.	White and Company
PCA Electronics, Inc.	Jay Stone & Assoc.
Polarad Electronics	T. Louis Snitzer Co.
Quan-Tech Laboratory	Hugh Gray Company
Radiation Counter Labs	White and Company
Rantec Corp.	O'Halloran Assoc.
Sage Electronics Corp.	Hugh Gray Company
Sanborn Company	Neely Enterprises
Sensitive Research Instrument	McCarthy Assoc.
Sierra Electronic Corp.	T. Louis Snitzer Co.
Sorensen & Co.	McCarthy Assoc.
Technology Instrument	Long & Associates
Telonic Industries	T. Louis Snitzer Co.
Transistron, Div. Van Norman	O'Halloran Assoc.
U. S. Science Corp. (Topp Ind.)	Premmco, Inc.
Universal Electronics	T. Louis Snitzer Co.
Varian Associates	Neely Enterprises
Waltham Electronics Corp.	Hugh Gray Company
Weinschel Engineering	O'Halloran Assoc.
Wincharger Corp. (Zenith Radio Corp.)	Premmco, Inc.
Winchester Electronics	Long & Associates

INDEX TO ADVERTISERS

Хотите ли вы играть в рулетку?*

*RUSSIAN ROULETTE...ANYONE?

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KIN TEL, San Diego, California
SANBORN COMPANY, Waltham, Massachusetts
VARIAN ASSOCIATES, Palo Alto, California

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SAN CARLOS: 501 Laurel St., Phone: LY 1-2626, TWX: San Carlos-Belmont CAL 94
SAN DIEGO: 1055 Shafter St., Phone: AC 3-8106, TWX: SD 6315
ALBUQUERQUE: 107 Washington St. S.E., Phone: AL 5-5586, TWX: AQ 172
PHOENIX: 641 E. Missouri Ave., Phone: CR 4-5431, TWX: PX 483
LAS CRUCES: 114 S. Water St., Phone: JA 6-2486, TWX: Las Cruces NM 5851
TUCSON: 232 S. Tucson Blvd., Phone: MA 3-2564, TWX: TS 5981

Membership Status

Following are the names of IRE members who have recently entered our area, thereby becoming members of the San Francisco Section:

Elmer D. Akerberg
Virgil R. Arhens
Herbert Bandes
Bernard J. Barranger
Hans E. Baumgartner
Robert N. Bean
James Berk
William N. Bogle
Rudolph J. Brebrick
Paul H. Brown
George S. Buice
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David S. Swainston
Hendrik J. Ten Zeldam
Stanley W. Thomas
Edward F. Vance
Gerald G. Vurek
Bernard Widrow
Robert G. Williams
Yonehisa Yamagami
Lofti A. Zadeh

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

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Williams B. Ashe
Donald A. Ashford
Tom E. Atherstone
Bernard B. Bellit
Clarence L. Bennett
Charles F. Brothers
Donald E. Caddes
John L. Campbell
Robert E. Cayce
William M. Clark, Jr.
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Arthur W. Duell
James L. Fear
Phillip B. Friedrichs
Joseph A. Gillis, Jr.
Arthur H. Gilmore
R. George Glaser
Richard J. Grich
Erwin J. Hauber
Reginald S. Herbert
Earl R. Hibbard
Paul M. Honore
David R. Hunter
Robert E. Jeffers
Peter W. Jensen
William B. Joyner
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Curtis G. Lawson
Stanley S. Leese
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Marko I. Lipanovich
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Philip H. Maxwell
Channing W. Medwedeff
Robert W. Moreno
Charles S. Mulloy
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Martin E. Riley
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William L. Shelton
Gilbert P. Sherburne
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Willis E. Swanson
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Eugene W. Vahlkamp
Richard P. Warrick
Emil F. Wasniewski
Bernard Wechsler
Charles G. Wheeler
August M. Wildberger
Howard A. Williams
Wood H. Wymond

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

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Otto H. Krause
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Hyman Olken
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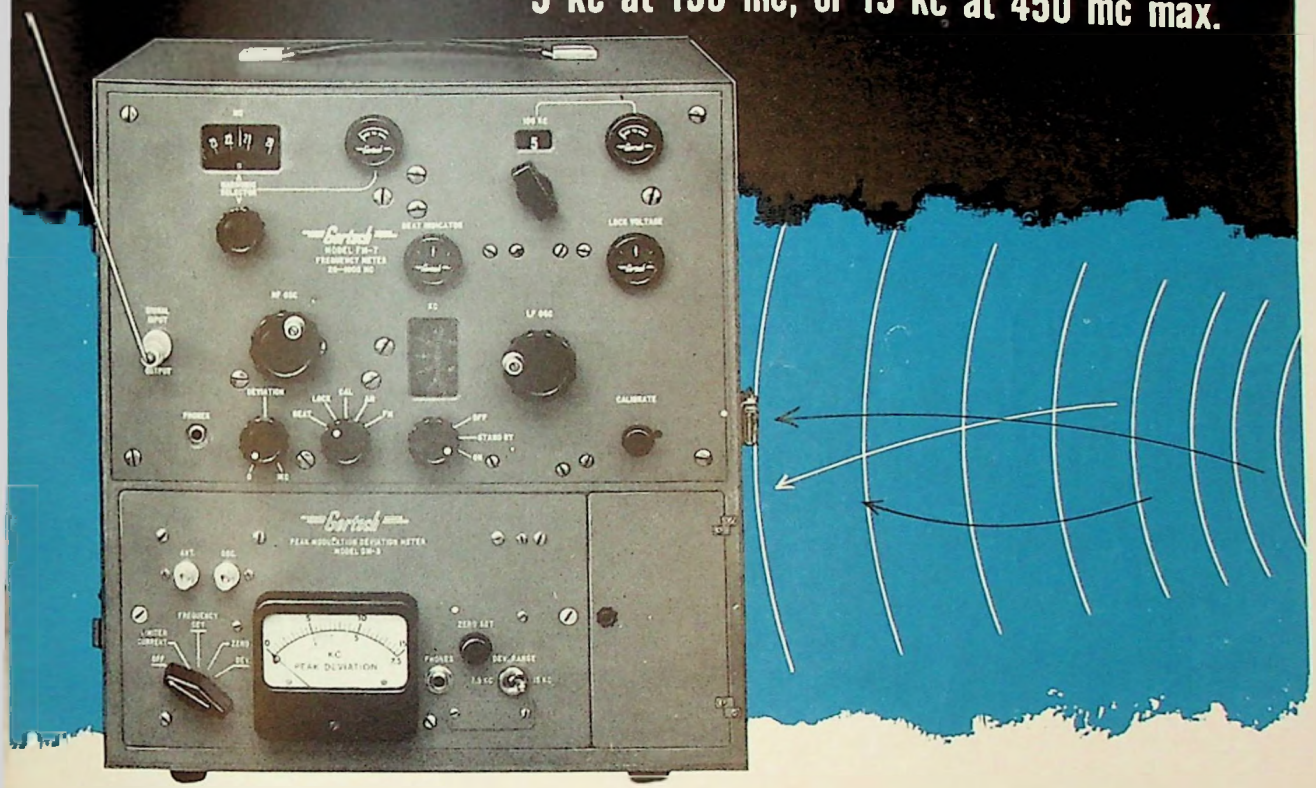
New Gertsch Freq Meter

MEASURES AND GENERATES: 20 mc to 1000 mc

ACCURACY: 0.0001%, exceeding FCC requirements 5 times

MODULATION: AM, 30% at 1000 cps; FM, 1 kc at 30 mc
5 kc at 150 mc, or 15 kc at 450 mc max.



This portable instrument in one complete package enables you to measure both frequency and frequency deviations in the maintenance of mobile communications systems.

As optional equipment the FM-7 Frequency Meter can be combined with the new DM-3 Deviation Meter as illustrated. The DM-3 is a dual-range deviation meter with 15 kc and 7.5 kc full scales.

By combining the FM-7 and the DM-3 you get a single instrument capable of measuring and generating carrier frequencies *plus* reading peak modulation deviation.

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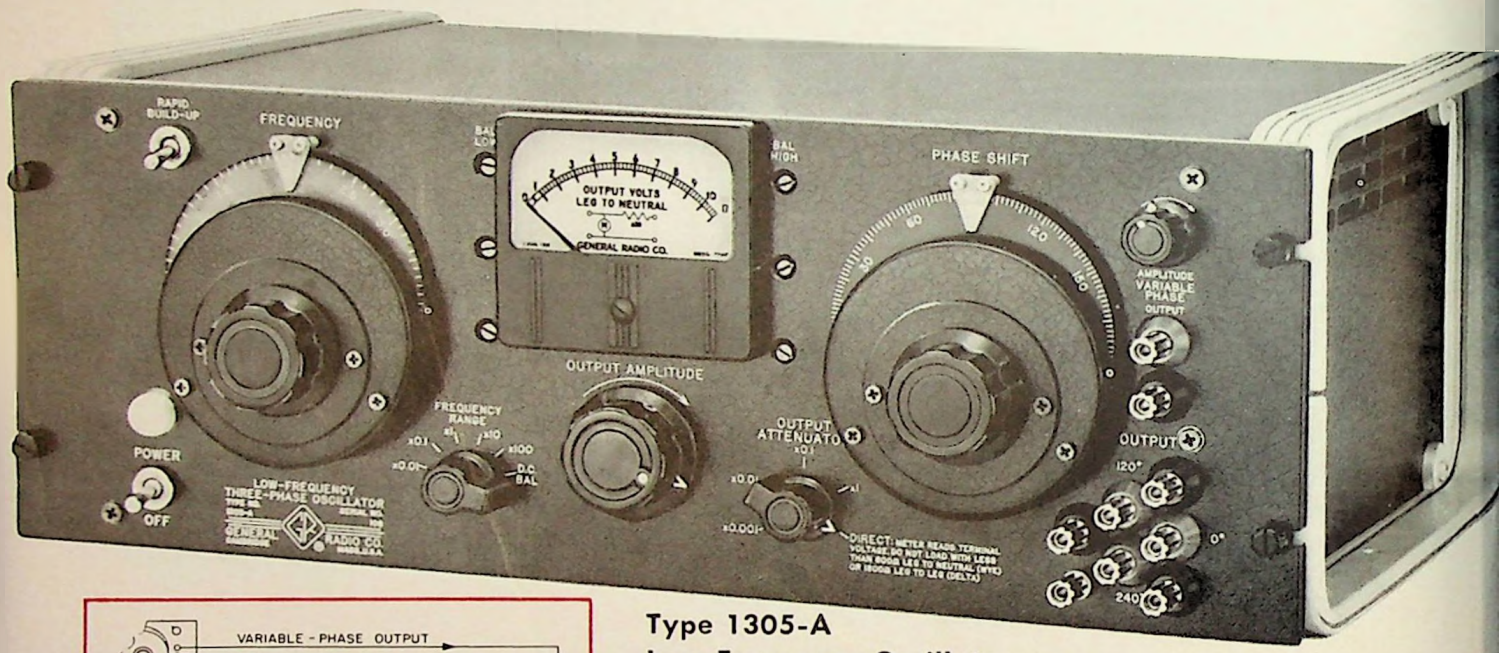

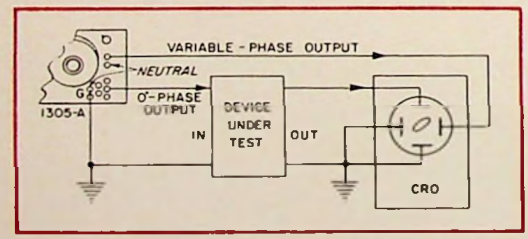

Complex transfer characteristics of devices or systems are readily measured with the Type 1305-A Low-Frequency Oscillator. With the setup above, you need only adjust the Oscillator's continuously-adjustable phase shifter until the Lissajous ellipse on the oscilloscope is closed — the dial setting then gives phase shift directly. Gain is readily determined by calibrating the scope face with the aid of the Oscillator's panel meter, and then comparing vertical height of the oscilloscope pattern before and after the device under study is connected to the test setup.

Type 1305-A
Low-Frequency Oscillator

Frequency Range: 0.01 to 1000 cycles in 5 ranges. **Accuracy** ±3%

Three-Phase Output: 10-volts rms, open circuit, line-to-neutral, behind 600Ω in each phase. Output constant with frequency to ±5%. Phase voltages are equal to within ±2%.

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