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

May, 1961:
Cover: Consoles are being installed and tested at the USAF’s Satellite Test Center in Sunnyvale. It coordinates and meshes the launch, tracking, data acquisition and recovery activities for Air Force satellites.
p. 38: Among the engineers accepted as new IRE members is Alan F. Shugart. He had come to IBM’s disk drive division in San Jose in 1955, working on the RAMAC, and his team invented the floppy disk. After serving as VP at Memorex, he founded Shugart Associates, then Seagate Technology. He was unsuccessful in electing his dog, Ernest, to the U.S. Congress.
The Varian VA-853 CW amplifier klystron features an extremely flexible power range at 755 to 985 Mc — from 75 kW to as low as 10 kW. Provides new possibilities in the development of troposcatter systems. Designed to meet USAF specifications for forward scatter tubes.

One power amplifier serves the entire output range. Power can be varied easily by adjustment of the beam voltage. Drives from a 5 W exciter. High gain — 50 db — is provided by five internal cavities. Compactly designed, with input and output couplings preset for flat rf lines. Just tune to desired frequency; no other physical adjustments are necessary.

Noncritical electromagnet provides a self-centering mount; the tube can be removed as a unit, inserted directly — no need for roll-out dollies.

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*May 1961*
Q. WHAT'S THE LATEST ABOUT ARNOLD 6T CORES ON THE COAST?

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Arnold 6T cores are guaranteed against 1000-volt breakdown. . . guaranteed also to meet most military specifications for operating temperatures. The 6T case is extra rigid to protect against strains.

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MAY 1961
May 1961

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CONTENTS

Meeting Calendar .................................................. 8, 9
WESCON .......................................................... 9
Meetings Ahead .................................................... 10
Section Ballot ...................................................... 13
Meeting Reviews
   PGBME (Spelvin) .................................................. 16
   PGI (Burlingame) ................................................ 18
   PGAP (Guthart) .................................................. 18
   PGED (Borghi) ................................................... 22
   PGA /AES (Oleson) ............................................. 24
   PGAP (Martin) ................................................... 26
Grid Swings ......................................................... 32
Events of Interest ............................................... 36
Manufacturers Index & Index to Advertisers .................. 40

Cover

In Sunnyvale, the USAF Satellite Test Center, command post for the Air Force earth satellite programs, was activated in January 1960. An interior view of the control center of the network of technical stations required to operate Discoverer, Midas, and other Air Force programs, appears on the cover.

Personnel are Capt. F. S. McCartney, Air Force, assistant system test controller; Major Keith Smith, Air Force, System test controller; Ned Spitzer, Lockheed, assistant test director; and James Sutherland, Radiation at Stanford, installation engineer.

As the focal point of the satellite complex, the Satellite Test Center provides the direction which coordinates and meshes the launch, tracking, data acquisition, and recovery activities during satellite operations.

Design and installation of the display-systems equipment were performed under contract by Radiation at Stanford—other local contributors being the Vicon Corp., division of Insul-B-Corp., and Dymec, a division of Hewlett-Packard.

Consoles visible contain cctv equipment, communications facilities, and remote controls for audio tape recorders. Large screens permit projection of satellite tracks, maps, weather information, and similar data.

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May 1961
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MEETING CALENDAR

SAN FRANCISCO SECTION

Annual Dinner Meeting
Speaker: To be announced
Place: Villa Hotel, 4000 S. El Camino Real, San Mateo
Reservations: See page 13 for reservation forms

PROFESSIONAL GROUPS

Antennas & Propagation
Speaker: Prof. R. S. Elliot, U.C.L.A.
Place: Room 101, Physics Lecture Hall, Stanford University
Dinner: 6:30 P.M. (Social Hour 6:00 P.M.), The Red Shack, 4085 El Camino Way, Palo Alto
Reservations: Odette Moore, DA 6-6200, Ext. 2414, by noon June 7

Circuit Theory
Speaker: Harry D. Huskey, professor, University of California
Place: Lockheed Auditorium, 3251 Hanover Street, Palo Alto
Dinner: 6:00 P.M., Red Shack, 4085 El Camino Way, Palo Alto
Reservations: Informal, none required

Electronics
(Joint meeting with PGMTT)
"The Laser"
Speaker: Dr. T. H. Maiman, director, applied physics laboratory, Quantumtron, Inc.
Place: Room 100, Physics Lecture Hall, Stanford University

Engineering Writing & Speech
Speaker: Richard B. Garretson
Place: Room 3B, Hewlett-Packard Company, 1501 Page Mill Rd., Palo Alto

Information Theory
Speaker: David A. Huffman, associate professor of electrical engineering
Massachusetts Institute of Technology; visiting associate professor
University of California, Berkeley
Place: Main auditorium, Building 1, Stanford Research Institute, 333 Ravenswood Avenue, Menlo Park

Instrumentation
Annual meeting and plant tour
"Innovations in Test Instrumentation"
Speaker: Clay Rasmussen, manager, instrumentation section, Lenkurt
Place: Lenkurt Electric Co., 1105 Old County Road, San Carlos
Dinner: 6:30 P.M., The Gold Platter, 1000 El Camino Real, San Carlos
Reservations: DA 1-7751
MEETING CALENDAR

Microwave Theory & Techniques 8:00 P.M. • Thursday, May 18
(Joint meeting with PGED, see above)

Microwave Theory & Techniques 8:00 P.M. • Wednesday, May 24
“The S-Band Horn-Reflector Antenna and Maser Receiving Equipment for Project Echo”
Speaker: Dr. R. W. DeGrasse, Microwave Electronics Corp., Palo Alto
Place: Room 101, Physics Lecture Hall, Stanford University

Military Electronics 8:00 P.M. • Tuesday, June 6
“Circuit Design from Refractory Materials”
Speaker: W. Dale Fuller, Lockheed Missiles & Space Division, Palo Alto
Place: Auditorium, Bldg. 202, Lockheed MS&I, 3251 Hanover St., Palo Alto
Dinner: 7:00 P.M. (Social Hour 6:30 P.M.), The Red Shack, 4085 El Camino Way, Palo Alto
Reservations: Lou Gado, DA 6-7053
Refreshments will be served at the conclusion of the program in the auditorium

Product Engineering & Production 8:00 P.M. • Tuesday, May 23
“Application of Electron Beams in Electronic Fabrication Processes”
Speaker: D. A. Vance, design specialist, microsystems electronics dept., Lockheed MSD, Palo Alto
Place: Room 100, Physics Lecture Hall, Stanford University

Radio Frequency Interference 8:15 P.M. • Tuesday, May 16
(Joint meeting with PGSET, see below)

Space Electronics & Telemetry 8:15 P.M. • Tuesday, May 16
(Joint meeting with PGRFI)
“RFI Considerations in the Selection and Establishment of Satellite-Tracking Stations”
Speaker: John Kavanough, Philco WDL
Place: Building 202, LMSD, 3251 Hanover Street, Palo Alto
Dinner: 6:30 P.M. (Social Hour 6:00 P.M.), The Old Plantation, 1030 N.
San Antonio Road, Los Altos
Reservations: Mrs. Miller, DA 1-4175, before noon, May 16

CHRONOLOGICAL RECAP
May 16—Engineering Writing & Speech, Space Electronics & Telemetry/Radio Frequency Interference
May 18—Electron Devices/Microwave Theory & Techniques, Information Theory, Instrumentation
May 23—Electronic Computers, Product Engineering & Production
May 24—Microwave Theory & Techniques
June 6—Military Electronics
June 7—Antennas & Propagation, Circuit Theory
June 15—San Francisco Section

WESCON NEWS
ABOUT LITERATURE
WESCON’s anticipated 35,000 visitors will use special “credit cards” to request product literature. As a further step in streamlining the world’s second largest technical gathering, an agreement has been worked out with Addressograph-Multigraph Corp. for supplying thousands of embossed plastic “inquiry cards,” to be issued to WESCON registrants at three stations within the Cow Palace August 22-25.

The cards, similar to hotel and restaurant charge cards, will be embossed with the name, title, company affiliation, and address of the visitor. In contrast with the traditional “paper-gathering” forays of past major technical expositions, WESCON engineers and executives can simply present the Inquiry Card to the booth representative of any company or product line in which they are interested.

Exhibitor companies, all of which will be supplied with imprinting machines by WESCON, will quickly record all the name-and-address information on index cards also provided by the management of the show. Companies will then use the index cards for prompt mail service of product and company literature directly to the inquirer.

The service presents several major advantages to exhibitors and visitors alike, Larson pointed out. In the first place, briefcase “tonnage” will be reduced sharply for registrants interested in getting the latest line on developments.

(Continued on page 10)

FAR LEFT
Back around the first of the year, the Chamber of Commerce and the Kiwanis Club of Palo Alto jointly held a luncheon to commend Philco Corporation on their “outstanding accomplishment and contributions in the field of space age communications.” Joseph N. Herszberg, marketing vice president, seems almost as pleased as Oscar T. Simpson, general manager of the western development laboratories, receiving the physical award from Tully C. Knowles, Chamber president, Onlookers, John Ball, mayor of Palo Alto, and Alexander Bodi, Kiwanis president

LEFT
Jack McCullough and Bill Eitel prepare to raise the first Q RIQAP flag in the Bay Area over the San Carlos Eimac plant. The award was made by Col. B. R. Painter, commanding officer of the western regional office of the U. S. Army Signal Supply Agency. Q means quality; RIQAP means reduced inspection quality-assurance program; and the award means sort of an honor system for the production of Eimac tubes.
MORSE WESCON

MORE WESCON

ments of 1180 exhibiting companies.
Chances of loss or misplacement of
imported materials during the busy
four-day show are also eliminated, and
exhibitor companies are free of the
pressures of supplying their booths with
thousands of pieces of printed informa-
tion daily. Instead, corporate brochures
and other materials can be sent directly
to interested persons. Waste and dupli-
cations should be eliminated, Larson
said, along with the time required to
register thousands of requests by hand.

WESCON NEWS

ABOUT RECRUITING

WESCON again has asked the
electronics industry for a "gentlemen's
agreement" to restrict personnel re-
cruiting activities.
The "gentlemen's agreement," which
resulted in a major de-emphasis on re-
cruiting during the 1960 show in Los
Angeles, was renewed in a letter signed
by Albert J. Morris, WESCON board
chairman, and sent to presidents of ex-
hibiting companies.

Accompanying the letter was a four-
page printed folder, which sets forth
WESCON's position on recruiting and
suggests some "guidelines" for insuring
the success of company social events at
the show.

In the booklet, the WESCON board
reviews the almost-unanimous coopera-
tion of exhibitors in eliminating overt
recruiting at the 1960 show, and con-
cludes that "it remains apparent that
aggressive recruiting of technical per-
nsonnel has no place in a forum of sci-
entific professionals . . . we again ask par-
ticipants to join in a 'gentlemen's agree-
ment' to eliminate this practice . . ."

In discussing exhibitor social events
at WESCON, the booklet recognizes
that "entertainment is a natural con-
vention function" and offers some sug-
gestions for insuring success of parties
and receptions. Included are notes on
methods of invitation, space require-
ments, timing, and general planning of
WESCON parties.

In his letter to electronics executives,
Morris congratulated them on individual
policies under which "no responsible
organization takes advantage of the
WESCON 'population' to launch per-
sonnel recruiting efforts."

WESCON NEWS

ABOUT EXHIBITORS

With 1180 booth spaces diagrammed
for the Cow Palace and auxiliary build-
ings, WESCON will offer its largest
exhibition of electronic products ever
when the trade show and associated
technical convention are held August
22-25 in San Francisco. Manager Don
Larson reports the accomplishment of

a successful space pattern allocating
booths to all companies on the waiting
list—as well as satisfying the require-
ments of veteran exhibitors under the
new set of show rules.

In recent years WESCON has oper-
ated under severe floor space restric-
tions, as many new and some growing
companies have sought to display their
wares. Using the large new Sports
Arena and an adjacent tented area in
Los Angeles last year, WESCON was able
to provide only 987 booths—leav-
ing a waiting list of almost 200 appli-
cants unsatisfied.

MEETING AHEAD

INSTRUMENTATION AT WORK

Professional Group on Instrumenta-
tion members will hear about and see
cost-saving new Lenkurt Electric produc-
tion test equipment at their May 18
meeting in San Carlos. Guest speaker
will be Lenkurt instrumentation develop-
ment manager Clay Rasmussen, whose
subject is "Innovations in Test Instru-
mentation." See the Calendar for other
details.

Lenkurt is a leading developer and
manufacturer in a highly competitive
field—voice and data telecommunica-
tions systems.

After dinner and their annual busi-
ness meeting, the group will tour
Lenkurt's development engineering and
standard lab quarters (where Stand-
ards Lab Manager Les Burlingame will
be host) and conclude with a visit to
the factory to watch the new test equip-
ment work.

Before joining Lenkurt in January
1960, Rasmussen had his own engineer-
ing development and services company.
Prior to that, he had been with Beckman
Instruments as a project leader, and as
an engineer in both production and de-
velopment.

MEETING AHEAD

THE LIGHT TOUCH

Practical realization of the laser (light
amplification by stimulated emission of
radiation) has made possible the gen-
eration of very-high-intensity coherent
light beams, with nearly perfect colli-
ation. The basic principles of opera-
tion, recent experimental results, and
potential applications will be discussed
at a joint PGED/PGMTT meeting on May
18. See the Calendar for details.

Dr. T. H. Maiman, the speaker, is
director of the applied physics labora-
tory at Quantatron Inc. He has spent
five years with the Hughes research lab-
atories conducting cyclotron resonance
studies in gases and solids, leading to
the development of a cyclotron reso-
ance harmonic generator. He was re-
sponsible for development of a filled-
cavity internal-magnet liquid-helium
maser, also first liquid nitrogen and dry
ice cooled masers. His experiments in
optical pumping of solids culminated in
development of the first optical maser
(laser).

For a year he was with Lockheed Air-
craft studying ionization problems and
measurements in connection with guided
missiles.

He is a member of the American Phys-
ical Society, Sigma Xi, Sigma Pi Sigma,
Sigma Tau, and Pi Mu Epsilon and has
published in areas of microwave and
optical spectroscopy, masers, and
lasers.

MEETING AHEAD

STRADDLING AUTOMATA

The newly organized San Francisco
Chapter of the Professional Group on
Information Theory will hold its first
meeting on May 18. The speaker will
be Professor David A. Huffman, asso-
(Continued on page 12)
GUARD AGAINST SIGNAL DROPOUTS WITH RELIABLE TAPES OF MYLAR®

Signal dropouts can make the data from critical tests completely useless. That's why the reliability of your magnetic tape base is so important. Tapes of Mylar®, because they're dimensionally stable, resist cupping which may cause signal dropouts from loss of contact with the recording or playback heads. They also resist swelling and shrinking which can cause track displacement.

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*Du Pont's registered trademark for its polyester film.
low-noise traveling-wave maser and associated equipment. Overall system noise temperatures of 17K for the antenna pointed vertically to about 150K for the antenna on the horizon were obtained at the operating frequency of 2390 mc. Various aspects of the design of the antenna and traveling-wave maser will be discussed. Some thoughts on possible trends in future design of antennas and masers for such ultra-low-noise receivers also will be discussed.

**meeting ahead**

**TRIPLE-BARRELED PLASMA**

When PGAP convenes in early June, R. S. Elliott will discuss "Interactions of a Plasma With Microwaves: Some Recent Experiments." Consult the Calendar for details.

The radiation pattern of a microwave horn covered by a plasma layer has been recorded and will be presented. Theoretical predictions of serious side lobe difficulties have been confirmed.

In the presence of a transverse magnetic field, a plasma can exhibit a triple resonance phenomenon. This has been observed in a waveguide experiment, and suggestions will be given for its utilization in diagnostics.

Static electric fields show promise for diverting plasmas from antenna apertures and a preliminary experiment which gave hopeful results will be described.

Plasmas can be used as variable directional couplers and some experimental findings with devices of this type will be discussed.

After receiving a bachelor’s degree in English literature at Columbia, Elliott transferred to engineering, and was granted a BS in electrical engineering in 1943. There followed three war years during which he worked on the proximity fuze, radar, and the early Bumblebee missile at the Applied Physics Laboratory. With war’s end, Elliott returned to graduate school, obtaining the MS in 1947 and the PhD in 1952, both from Illinois. During this period he also served as assistant professor and was baptized into the antenna profession via summer employment at Sperry and North American.

Upon completion of the PhD, Elliott served a year of active duty in the Navy during the Korean war, being associated with a missile program undertaken by the Naval Ordnance Laboratory. Three years of employment at Hughes followed, during which time he was principally engaged in research on surface wave antennas.

In 1956 Elliott left Hughes to participate in the formation of Rontec Corporation, serving as its first vice president and technical director. In 1959 Elliott returned to his first love—teaching—and is now professor of engineering at UCLA. He offers a four-semester graduate sequence in electromagnetic theory and its applications, and shares with Professor Hersberger the responsibility of directing a plasma research program.

Elliott is a member of Sigma Xi, Tau Beta Pi, and a Fellow of the IRE. He is married, the father of four evenly divided children, and lives in Woodland Hills, California.

**meeting ahead**

**PARAMETRIC-AMPLIFIER DESIGN**

The San Francisco chapter of PGCT will hear a talk by Dr. E. S. Kuh of the University of California on "Parametric Amplifiers: Circuit Theory and Design" at its June meeting. See the Calendar.

Parametric amplifiers have long been used in certain types of mechanical systems. The development of new components has made possible new applications of the parametric principle in electronic amplifiers.

(Continued on page 16)
As the San Francisco Section year starts drawing near to its official close, two culminating events appear. First, the election of a new slate of officers for 1961-62; and second, the annual Section meeting at which these officers are installed, at which newly elected Fellows are presented to the Section, and at which other awards are made.

Your participation in these two events is an important part of the really full-scale functioning of the Section.

Therefore, why not make plans now to join your colleagues on June 15 in the one Section activity designed to include items of interest for all members as well as their wives. The principal speaker of the evening is being chosen on that basis and details will be announced later.

Starting at 6:00 P.M., the cocktail hour will last until 7:30 when a buffet supper will be served. The location will be the Pacifica Room and the Terrace Bar of the Villa Hotel in San Mateo, and the cost is $5.00. Use the order blank below.

And don’t forget to vote!

Immediately below is your ballot for the 1961-1962 officers of the San Francisco Section IRE. Thumbnail sketches of the candidates will be found overleaf. Please fill your ballot out immediately and mail it—no postage required.

---

**San Francisco Section**

**BALKT 1961-1962**

☐ Chairman, S. F. Kaisel
☐ Vice Chairman, P. D. Lacy
☐ Secretary, Charles Susskind
☐ Treasurer, Jerre Noe
☐ Treasurer, Alan T. Waterman
[ ] VOTE FOR ONE

☐ Section-WESCON Director, Meyer J. Leifer

---

**San Francisco Section**

**ANNUAL MEETING**

**TICKET ORDER**

Please reserve _______ places for me at the Annual Meeting June 15 at $5.00 each.

☐ Check enclosed ☐ Check being sent ☐ Will pay at door

name ____________________________

company __________________________

address __________________________

telephone number __________________________
S. F. Kaisel
— for Chairman
President and technical director, Microwave Electronics Corp., Palo Alto, Senior Member IRE. Washington University, BSEE; Stanford, MA and PhD. Liston Industries, 1925-1951; Stanford ERL and ML, research associate, RCA, research engineer, Washington University, instructor, Harvard, special research associate; and USAF, technical observer.

Peter D. Lacy
— for Vice Chairman
Vice president and director of engineering, Wiltron Co., Palo Alto. Senior Member IRE. University of Florida, BSEE 1942; Stanford, MS 1947, PhD 1952. Stanford ML, research assistant and Sperry Gyroscope Fellow; Varian Associates, consultant; Hewlett-Packard Co., member of advanced development staff; Navy, radar countermeasures officer, member of technical mission to Japan.

Charles Süsskind
— for Secretary

Jerry Nae
— for Treasurer

Alan T. Waterman
— for Treasurer
Associate professor of electrical engineering, Stanford University; associate director, systems-techniques laboratory; consultant, Senior Member IRE. Princeton University, PhD physics; California Institute of Technology. SES, meteorology; Harvard University, AM and PhD in advanced research and applied physics. American Airlines, meteorologist. American Meteorological Society, American Association for the Advancement of Science, Sigma XI, American Physical Society.

Meyer Leiter
— for Section-WESCON Director
Chief engineer, Ampex Instrumentation Products Co., Redwood City, Fellow IRE. Brooklyn College, BS mathematics 1933; Columbia University, MA physics 1935, New York University, postgraduate work. Sylvania EDL, general manager microwave-device operations. Sylvania EDL, engineering manager and assistant director; Sylvania Bayside physics lab, manager of antennas and circuits. Sigma XI, Pi Mu Epsilon, Sigma Pi Sigma, and RESA.
MORE CIRCUIT THEORY

The talk will start with a review of the analysis of linear circuits containing a single periodically varying capacitance.

The formula for power gain of a parametric amplifier will be obtained in terms of the variable capacitance and appropriate impedances of an arbitrary embedding network. It will be followed by a study of maximum gain-bandwidth products for both inverting and non-inverting type circuits. Finally, synthesis procedures for broadband amplifiers will be given.

education

WHAT TO DO THIS SUMMER

Thirty classes will be presented by Engineering and Sciences Extension, University of California, during the summer of 1961 beginning in June. Courses in mathematics, the sciences, and various branches of engineering will be offered on the University of California campus in Berkeley, the San Francisco Extension Center, and in Sunnyvale, Menlo Park, and San Leandro. The following courses may be of special interest to electrical and radio engineers:

Analysis of Transistor Circuits X 430-ABC taught by Thomas R. Nisbet, Sunnyvale High School, begins June 19.
Introduction to the Theory of a Complex Variable XB 185 begins June 9, Stanford Research Institute, Menlo Park.

For complete scheduling of all summer classes and for further information, please contact Engineering and Sciences Extension, 2451 Bancroft Way, Berkeley 4, California.
opportunities for systems analysts

Hughes Aerospace Engineering Division has openings for Systems Analysts to consider and analyze a wide spectrum of basic problems such as:

What are the requirements for manned space flight?

Justify choice of systems considering trade-off of choice in terms of cost effectiveness.

Automatic target recognition requirements for high speed strike reconnaissance systems or unmanned satellites.

IR systems requirements for ballistic missile defense.

Optimum signal processing techniques for inter-planetary telecommunications

Maintenance and logistic requirements for weapon systems.

The positions involved with the solution of these basic and critical questions present opportunities for the optimum application of the technical and analytical background of graduate physicists and engineers with both systems and specialized experience.

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MORE ION AGE

other in nuclear submarines. At the Bevatron, during a shutdown period, workers found it nauseating to enter a certain area where measurements indicated that radiation was not high. Members of the bacteriology department went to this area and made measurements which revealed large excesses of positive ions.

In the other case, nuclear submarines provide a problem, not from the nuclear power plant, but from the large number of fluorescent indicators on board. These effect a predominance of positive ions which are routinely dispelled by the introduction of negative ions.

—GEORGE SPELVIN

meeting review
DATA UNLIMITED

Robert L. Sink, associate director of the data lab division of Consolidated Electrodynamics Corp., Pasadena, Calif., opened the discussion at the late February meeting of PG1 with some pertinent remarks as to the need for “Large-scale Data Handling Concepts.” He said in part:

Many interesting and important programs require automatic systems for data gathering, processing, display, and storage. A satellite is a fine example. The sheer volume of the data that must be handled has resulted in the design and construction of data-handling systems which are capable of making measurements at a higher rate and with greater accuracy than would have been considered desirable or possible a few years ago.

Large-scale systems are based upon time division multiplexing methods using analog-to-digital converters to achieve resolution, accuracy, and storage capability in an advantageous fashion.

Pulse-code modulation (PCM) methods of data handling have been used at bit rates up to about 500,000 per second. The total information transmitted can be used either for a few high-frequency channels or a large number of low-frequency channels in a rather arbitrary fashion. System resolution can be exchanged for system speed.

Pulse-code modulation methods have attracted major support because of the capability of achieving high resolution, because of efficiency and reliability in transmission and storage, and because the data is in a form that can be conveniently selected and introduced into a computer by data-handling equipment. Noise pickup, amplifier drift, and switching errors cause an error in the analog accuracy equal to 10 microvolts of equivalent signal.

Current programs are turning towards reduction of the number of amplifiers in a complete system requiring the use of switches operating at low levels.

There are 16 different data-gathering systems. The high-level voltage range is 1 to 10 volts with 5 volts predominant. The low-level is 5 to 50 millivolts with 20 the most popular. The bit rate is 300,000 to 500,000 bits per second with 384,000 most popular. Ten to 1,000 frames per second can be used; 120 is the most popular. Four groups of 32 channels each with the above characteristics, using two electronic switches per electronic group allowed Douglas Aircraft to make a wideband differential amplifier in a volume of 0.4 cu. ft.

In some of the applications, only 5 per cent of the total information is actually used. This has led to a logical elimination of the groups of data which are not pertinent. This is important when you consider that in a satellite run from solar batteries, it is necessary to husband energy used and good judgment must be applied to the selection of data fed to the equipment.

Sink ended his talk with the statement that there exists knowledge far beyond any known demands. This means the data men can do almost any job demanded of them. Slides and pictures of equipment were used in the discussion.

—LESLIE G. BURLINGAME

meeting review
UNCERTAIN PLASMAS

Early in February, Dr. Oscar Beman of Stanford University spoke to the San Francisco Chapter of PGAP. The talk was the first in a series.

(Continued on page 20)
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MORE PLASMAS
three tutorial lectures on plasmas. The
subject for Buneman’s talk was “Plas-
ma: A Propagating Medium and a
Source of Radiation.”

A plasma is defined as an assembly
of free ions and electrons such that
the number density of the ions equals
the number density of the electrons.
Plasmas exist in the interplanetary gas,
in the laboratory during voltage break-
down, and in thermonuclear reactions.

The definitions of plasmas is some-
what contradictory for electrons and
ions are never really independent of
one another. The long-range (collective)
coulomb interactions always exist be-
tween charged particles. Particles are
said to collide when the proximity of
one particle appreciably deflects the
second (of the order of 10 degrees or
more).

There followed a discussion of the
properties of totally ionized plasmas
as they appear in the laboratory, in
space, and in thermonuclear reactions.
The significant properties of a plasma
are: (1) particle density, (2) particle
temperature, (3) mean free path, (4)
Debye length, (5) collision frequency,
and (6) plasma frequency.

The significance of each of these
properties was demonstrated with a
simple example. Buneman considered
a uniform plasma perturbed by a one-
dimensional electron distribution. The
speaker noted that this system is a
perfectly linear oscillator, where the
plasma frequency equals the oscillator
frequency, and is a measure of col-
cective interactions. The departure from
statistical equilibrium leads to negative
damping of these oscillations, the en-
hancement of noise, and radiation.

Boltzmann’s Kinetic Theory tech-
iques in conjunction with Maxwell’s Elec-
 tromagnetic Equations have been applied
to derive the spectral law for plasma
fluctuations and the equations govern-
ing propagation through a plasma in
magnetic fields. The expressions for the
refractive index of a plasma were then
noted. These expressions demonstrate
the interesting cut-off characteristics of
plasmas as a propagating medium.

The principal problem confronting
the plasma physicist today is that of
the stability of finite plasma configura-
tions. The boundary of finite plasma
configurations is usually a magnetic
field. The most stable plasmas are those
in which the confining magnetic field is
self-induced.

Buneman concluded his talk by show-
ing a slide demonstrating two stream
instabilities. The two streams are
formed by an electron beam moving
through a collection of static ions. The
possibility of stable plasma confine-
ment is uncertain.

(Continued on page 22)
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may 1961
**MORE PLASMAS**

Buneman was born in Milan and went to high school in Hamburg. He received his BS, MS, and PhD degrees at Manchester University, England. Buneman was senior principal scientific officer at the British Atomic Energy Research Establishment at Harwell. For the past ten years he has been a lecturer in applied mathematics at Cambridge University, England. Professor Buneman is currently a member of the plasma dynamics area of electronics at Stanford University.

He has had extensive research experience with significant contributions to the understanding of magnetrons, ion optics, reactor design, and nuclear instrumentation.

—J. Guthart

**Planning Review**

**Planning A Long Trip?**

One of the most attractive means for propelling vehicles through space consists of the use of convergent ion guns similar in many respects to the electron guns commonly used in high-power linear-beam microwave tubes. Support for this statement was provided by George R. Brewer of Hughes Research Labs in a very interesting talk given at the March meeting of PGED at Stanford.

Brewer began with a general picture of propulsion requirements covering topics such as payload, acceleration, and the comparison of chemical and electrical propulsion systems. This was followed by a description of ion-gun components, and problems in design and their solution. An estimate of future scientific and business activity closed the talk.

Probably the most significant term used in the discussion and comparison of space engines is "specific impulse." This is defined simply as the exit velocity divided by the gravitational constant. For long missions, such as to Mars or Venus, a higher specific impulse means significant increases in payload. The specific impulse of chemical propulsion systems is 10 to 20 times that of chemical engines. The magnitude of the thrust available from ion engines is, however, very small; they cannot be used to get off the ground. In moving from orbit to orbit, their integrated effect is large, hence their use for relatively long trips. Using a Mars trip as an example, assuming typical values for various constants and starting from a 300-mile orbit about the earth with a 9000-pound vehicle, the payload delivered to Mars is 500 pounds in 250 days by the chemical engine and 4000 pounds in 400 days by the ion engine. This is a rather startling advantage for the ion engine.

Getting back down to earth and current problems, the basic engine components are shown in the accompanying figure. Cesium vapor is fed by the controller to the back of a hot (1100 to 1200 C) porous tungsten cathode button. After passing through the butted it is accelerated in a Pierce type gun. After passing through the accelerating electrode hole, the beam is neutralized by a stream of electrons injected radially by a second Pierce type gun, before being ejected from the ship. In passing through the hot button, the Cesium is

(Continued on page 24)
Big wheel? Little wheel?

A sign on a desk or an office door can't tell you. In industry many of the most valuable engineers don't have impressive titles. Yet, they're heavyweight engineers—thinking, planning, carrying out, developing, designing, analyzing. Their value lies, not in governing, but in doing. Other engineers, equally as capable, serve best by stimulating and leading engineers. Both kinds are vitally necessary because without them you fail to accomplish your goals and you fail to grow.

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99 per cent ionized. Cesium is used because it is easily ionized and provides the desired specific impulse at a reasonable accelerating voltage. Current densities of 5 to 10 ma per cm² can be obtained from these cathodes. The surface physics of these buttons presents a critical problem area.

Design and experimental work at Hughes on guns similar to that shown in the figure, have produced some gratifying results. An important aid in the design was the use of an electrolytic tank with current injection to simulate space charge. This tank, used in conjunction with an analog computer, was developed by Brewer and his associates over the past few years and has been very useful in the design of high-perveance electron guns. As in the case of electron guns, space-charge forces are found to be significant. Also the electrolytic tank is useful in minimizing anode interception, which, in the case of ion guns, leads to serious erosion. Erosion caused by interception of the ion beam on the accelerating electrodes results primarily from poor gun design and initial tangential velocity of the Cesium ions.

Another problem, not appearing in electron-gun design, is that of electron exchange between ions which have been partially accelerated and the few neutral atoms. This exchange increases with increasing voltage. The result is a stationary ion in the electrode space. Fortunately, it has been found that most of these do proceed through the beam aperture. Shaping of the focus electrodes also serves to reduce interception further.

Initial experiments have been concerned primarily with the interception and neutralization problems. The interception has been reduced to values approached by electron guns (anode current/cathode current = 2 × 10⁻¹⁰) and is adequate for first-generation engines. Current thinking requires that the beam on leaving the accelerating electrode aperture be neutralized in detail. Neutralization was checked by noting the beam spread with the neutralizer on and off. The reduction in beam spread due to space charge with the radial electron beam off checks with expected results indicating that the neutralizer works well.

New tests are currently in preparation for a larger hollow-beam gun. As with electron guns, the desire for higher perveance persists. This gun will be tested in a large vacuum chamber having the rather remarkable pumping speed of 200,000 liters per sec while maintaining a vacuum of 10⁻¹⁰ mm Hg.

Flight tests are being planned by NASA for the Fall of 1962. The purpose will of course be to check the engine under actual operating conditions.

Immediate future possibilities for ion engine use in addition to the long range need for an interplanetary drive, includes the control of communications and other satellites in attitude and orientation.

Business aspects for the guns themselves are modest, perhaps a few million dollars per year. Of the current $84 million space propulsion program, about 3 million is devoted to ion propulsion. The major future costs will probably be incurred in connection with other components of the vehicle such as guidance equipment, etc. with the engine itself remaining secondary, cost-wise.

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(Continued on page 26)
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May 1961
the performance connected with the JBL LX5 speaker system, a new product development at the J. B. Lansing Co. The JBL LX5 system consists of a Model LE15A 15-in. low-frequency loudspeaker, a Model LE85 high-frequency horn and dispersion lens assembly, and a Model LX5 crossover network. Also available is the Model JBL C50 enclosure specifically designed for the JBL LX5 speaker system.

Craig and Augspurger introduced the audience to some of the basic practical design considerations underlying the development of the low- or medium-efficiency speaker systems which utilize box enclosures. The heart of the JBL system is the Model JBL LE15A 15-in. low-frequency loudspeaker which is said to deliver exceptional bass response without distortion in enclosures as small as 6 cu ft. The loudspeaker cone resonance is about 20 cps in free air and about 40-45 cps in an enclosure. The speaker has a 19½-lb magnetic circuit which produces a magnetic flux of over 500,000 Maxwells. The LE15A specifications on power capacity state that the most powerful high fidelity amplifiers available may be used without danger of overload.

The JBL LE85, a wideband high-frequency driver, can be coupled to the HL91 horn-lens assembly, which is designed to maintain approximately the same sound distribution at 10,000 cps as at 1500 cps. The LX5, a specially designed crossover network, provides a smooth integration of the low-frequency sound characteristics of the LE15A with the high-frequency sound characteristics of the LE85, the cross-over frequency being at 500 cps.

Following the presentation, interested members of the audience queried the speakers on several details of loudspeaker system design, on methods of measuring speaker power capability, and on the merits of other types of loudspeakers such as the electrostatic type or the ionovac.

---S. OLESON

traffic problems in the plasma

The third and final tutorial lecture sponsored by the San Francisco Chapter of PGAP was held in early March at Stanford University. Guest lecturer was Dr. Charles Cook, manager of the molecular physics section of Stanford Research Institute. Cook spoke on the collision cross sections and collision frequencies of partially ionized gases.

The speaker emphasized that microscopic and macroscopic calculations of plasma characteristics are necessary in studies concerning the ionosphere either to substantiate experimental measurements of propagation constants or to furnish those that are otherwise unavailable. Also emphasized was the fact that a basic understanding and description of microscopic plasma phenomena is necessary to adequately understand and calculate the macroscopic plasma characteristics.

Cook first described two experiments for measuring collision cross section. One experiment consisted of crossing a beam of electrons with a beam of neutral particles and measuring the residual current due to the interaction of electrons and neutral particles. This current measurement allows the calculation of a collision cross section which is a function of plasma current, electron number density, neutral particle number density, collision frequencies, and collision volume.

The second experiment consisted of measuring the current density due to electron scattering over the solid angle about an interaction of electrons and neutral particles. This measurement of current per unit solid angle allows the calculation of a differential scattering cross section useful in obtaining the collision cross section and the collision frequency of the interaction.

(Continued on page 28)
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may 1961
MORE PLASMA COLLISION

The macroscopic collision cross section and collision frequency of a heterogeneous plasma was described to result from the microscopic behavior of interactions between the constituents of the plasma. This allows individual studies of unique interactions of a given type between two or more plasma constituents to be extended so as to describe macroscopic properties of the plasma as a whole.

Basic formulas were presented for the conductivity of a slightly ionized plasma in an isotropic region. However, a complex "collision frequency" ever, in these formulas, Cook considered a complex "collision frequency" parameter in the dissipative term of the equation of motion. Conductivity was then expressed as a function of the usual three "frequency" parameters, including the averaged collision frequency, this microscopic parameter was obtained from integrating over the electron-velocity distribution. The formulas for conductivity presented by Cook differ to some degree from those presented in the basic literature derived by assuming only a real "collision frequency" parameter.

The lecture was concluded with a presentation of results from studies relating to the collision frequencies and the collision cross sections of the ionosphere as a whole as well as of the constituents comparing the ionosphere.

The collision frequencies were graphically represented as a function of altitude and temperature. Through the use of transparent graphical overlays, these frequencies were compared for the heterogeneous plasma of the ionosphere and for the individual plasma constituents of the ionosphere. These results indicate substantial correspondence in collision frequencies in the plasma as a whole to those of the individual chemical constituents which dominate the structure of the ionosphere at the altitudes and temperatures surveyed.

The collision cross section N₂, O₂, and O as measured by several investigators were compared over a range of energy levels. Of these, the N₂ results compared most favorably.

A native of Nebraska, Cook graduated from the University of Nebraska in 1948 with a BS degree in electrical engineering. He received his PhD degree in physics and mathematics there in 1953. Before joining the staff of SRI, Cook was a research associate at the University of Nebraska. He was employed by the State of Nebraska department of roads and irrigation.

At SRI, Cook is engaged in studies of low energy atomic, ionic, and electronic impact phenomena.

—JAMES A. MARTIN
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LETTERS TO THE EDITOR

Palo Alto, Calif.

To the Editor,

Dear Sir:

Messrs. McCullough and Siegman have performed a real service for members of the San Francisco Section of the IRE in compiling their comprehensive report on engineering unity (Grid, March 1961, p. 12). They have lucidly summarized both the complexity of the many problems involved and the diversity of viewpoints regarding their relative importance and their possible solutions.

As a member of both the AIEE and the NSPE as well as the IRE, however, I think that paragraph (4) under “The AIEE’s Functional Plan” (op. cit., p. 28) deserves further comment and clarification. The statement that “the AIEE does not think that all engineers should necessarily be registered” is misleading and not quite correct.

In reference B of the cited report Walter J. Barrett (AIEE President, 1957-58) stated that in formulating the Functional Plan the AIEE’s Board of Directors voted “...to approach NSPE with the suggestion that its membership be opened, for a period of years, to unregistered engineers holding suitable grades in [appropriate] technical societies...” He added further that this suggestion was intended only as an interim measure by which NSPE might put itself in a much stronger position to carry out the responsibilities proposed for it by the Functional Plan.

In commenting on registration in the same reference, Mr. Barrett said, “AIEE has, for many years, recommended to its members that they take steps to register as professional engineers. The board of directors believes that this is an essential step in the full development of the practicing engineer, whether he be a consultant or employed in industry. We urge all young engineers to register in their states as early in their careers as possible.”

The statement in the cited paragraph that “NSPE’s reaction to this [suggestion] is not yet apparent” indicated a lack of understanding of the unique “grass roots” nature of the NSPE. Unlike the typical technical society, in which a member has little voice in its affairs beyond electing a slate of representatives, and in which all sections are bound by the policies of the national society, every state society in the NSPE has full autonomy in matters of local concern with respect to the national society. So does every chapter with respect to its state society. Thus although dropping the registration requirement for membership in the NSPE at the national level would require an amendment to its constitution, that does not preclude individual state societies or chapters from admitting members on a different basis at the respective local levels.

The NSPE polled its membership in 1957 and again in 1960 and an overall opinion regarding the registration requirement. Both times the majority of the respondents favored continuing it. Interest was shown, however, in admitting unregistered engineers, according to various other qualifications and with limited voting rights, at various levels of the organization, reflecting a desire of the respondents to extend the membership of the NSPE in any reasonable way to assist in implementation of the Functional Plan.

The NSPE board of directors has therefore adopted and maintained the recommendations “that membership requirements at the national level remain unchanged at this time,” but “that the several state societies seek ways and means of admitting qualified persons to membership, and take such steps as...

(Continued on page 31)

Aggressive and well-financed electronic manufacturer seeks:

General
Marketing Manager
reporting to V.P. Sales

candidate must now earn $14K

Experience Desired:
Semiconductor, electronic component or small systems sales. To have previously set up and directed sales efforts, distribution and representation staffs, customer application efforts, as well as publicity, literature preparation and shows. To be sales supervisor or higher in present position. Desirable that candidate should have brought new product from laboratory to market in solid state field.

Product
Sales Manager
reporting to General Marketing Manager

candidate must now earn $10K

Experience Desired:
Semiconductor, electronic component or small systems sales. Desirable that candidate have experience in bringing new product to market, and presently be reporting to product sales manager or higher.

Location: Dallas, Texas
Palo Alto interviews by principals in mid-May.
Address resume with present and expected earnings to:
CONSULTANT, 3320 THOMAS DRIVE
PALO ALTO, CALIF.
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Make Reservations?
LETTERS TO THE EDITOR

Palo Alto, Calif.

To the Editor

Dear Sir:

Messrs. McCullough and Siegman have performed a real service for members of the San Francisco Section of the IRE in compiling their comprehensive report on engineering unity (Grid, March 1961, p. 12). They have lucidly summarized both the complexity of the many problems involved and the diversity of viewpoints regarding their relative importance and their possible solutions.

As a member of both the AIEE and the NSPE as well as the IRE, however, I think that paragraph (4) under "The AIEE's Functional Plan" (op. cit., p. 28) deserves further comment and clarification. The statement that "the AIEE does not think that all engineers should necessarily be registered and it therefore is urging that NSPE drop its present registration requirement..." is misleading and not quite correct.

In reference B of the cited report Walter J. Barrett (AIEE President, 1957-58) stated that in formulating the Functional Plan the AIEE's Board of Directors voted "... to approach NSPE..."
may be necessary in their respective states to attain this objective."

In response to the latter recommendation, some state societies in the NSPE have made provisions for membership (at the state and chapter levels only) for suitably qualified unregistered engineers.

In other states, including California, the matter is still under study, and is reviewed from time to time in compliance with NSPE's Policy 45, which reads (in part): "The NSPE will continue to work for unity through a vigorous and continuing program of active cooperation with all other engineering societies in those programs having professional objectives on the national, state, and local levels, without prejudice as to the origin of the program."

Very truly yours,
Keith W. Henderson

N.B.: Emphasis in above quotations added.

References:
2. NSPE—Report of Committee on Improved Professional Activities to the Board of Directors, June 11-14, 1958. (Also published in AMERICAN ENGINEER, July 1958, p. 31.)
3. NSPE, "Results of Poll on Organization of the Engineering Profession," AMERICAN ENGINEER, June, 1960, p. 43.

Corning, New York

To the Editor

Dear Sir:

I enjoy your publication very much and find it is an excellent means of keeping up with the activities of my many friends in the S. F. area.

John L. Sheldon

The Grid now has 125 paid subscribers outside the Section area, many of whom are former SFS members exiled (temporarily, we trust) to other parts of the world. Remind us to tell you about gift subscriptions when the Christmas season is more imminent.—Ed.

"The year 1960 has been a climactic year for United States missile and space programs. American industry achieved several notable 'firsts' which went a long way toward restoring our national prestige in these areas..."

—From a memo to editors and writers from Lockheed Aircraft Corp.

Sunnyvale best by government test?

May 1961
grid swings

IT IS REPORTED

A new electronics firm to be known as Electromagnetic Technology Corporation has commenced operation as a research, development, and engineering organization with headquarters in Stanford Industrial Park at 1375 California Avenue, Palo Alto. Founders are: Dr. Alden H. Ryan, president; Dr. William A. Edson, vice president and director of research; Fred W. Morris, Jr., executive vice president; and Edward K. Proctor, Jr., in association with Edward O. Bassell of New York.

Ryan was formerly manager of the General Electric microwave laboratory at Stanford and previously an associate superintendent of the Naval Research Laboratory. Edson, one of the nation's outstanding authorities on microwave technology and circuit theory, recently resigned from the General Electric Company. He was formerly professor and director of the school of electrical engineering at the Georgia Institute of Technology. He is distinguished as a technical author and has been honored as a Fellow of the Institute. Morris, an authority in the fields of electronic warfare and strategic communication systems, has been active since World War II as an electronic engineering and management consultant to industry and the government. He was formerly an assistant professor of electrical engineering at the University of Southern California. In recent years he has been at SRI.

(Continued on page 34)

new product capsule advertisement

ILLUMINATED INDICATOR SWITCH

A push-button switch has been developed to provide the most compact, lowest-cost, unitized indicator switch available in the industry. It takes Sylvania indicator lamps of 4, 6, 10, 12, 16, 24, 28, and 48 volt sizes. A change in circuits merely requires a change in lamps. Using the long-life Sylvania indicator lamps rated at 5,000 hours life, maintenance costs are sharply reduced.

The construction of the switch incorporates four contacts for separate indicating and load circuits and it is rated at 5 amp capacity at 250 volts. The spring-loaded mechanism has a one-million-index life. The switch is a single-pole-double-throw switch with wiping contacts.

Sylvania Lighting Products, 60 Boston St., Salem, Mass.

new product capsule advertisement

LEAD-SULFIDE PHOTOCELLS

New development in the semiconductor field have enabled Cetron to offer a complete line of lead sulfide infrared cells.

These subminiature all-glass hermetically sealed cells are environmentally stable, with pins for socket mount or flexible leads.

They are now being used, or are adaptable for use, in such equipment as electronic computers, sound projectors, temperature measuring devices, infrared communications apparatus, missile guidance systems, fire detectors, and solar temperature computers.

The line of cells includes a broad range of stock sizes, broken down into several sensitivity ratings.


new product capsule advertisement

SEQUENCE TIMING SWITCHES

A new series of all-solid-state sequence-timing switches designed for space probe and re-entry applications is now available. Designated Series 7000, these digital switches feature accuracy to 0.3% and initial timing periods adjustable from 0 to 30 seconds. They are capable of operation under high spurious line peaks and in wide ambient temperature ranges.

Miniaturized packages provide complete circuitry for up to three distinct time sequences per unit in less than 10.6 cu in, weighing only 13 ounces. Power requirement is 1.5 watts maximum from 28 v d-c; the switch is automatically reset by the application of vehicle power.

James K. Story, Transducers and Systems, Donner Scientific Co., Concord, California.

The appointment of Terence Furey to the position of manager, audio products for Ampex International S.A., has been announced. Furey was former sales manager, consumer products, for Electro-Voice of Buchanan, Michigan.

Myron C. Pogue has been appointed manager of planning for the western development laboratories of Philco Corporation. A native of Salem, Oregon, Pogue received his AB in speech from the Willamette University, Salem, Ore. He also did advanced work at Boston University in philosophy and graduated from the University of Pittsburgh School of Business. Prior to joining Philco he was manager of market research for Eitel-McCullough.

Appointment of Dr. Rudolph G. E. Hutter as chief engineer, microwave device operations of the electronic tube division of Sylvania Electric Products Inc., has been announced. In his new position, Hutter will be responsible for research, development and engineering activities of microwave device operations in Mountain View and at Williamsport, Pa., as well as for technical coordination with Palo Alto and Bayside, N. Y., laboratories.
R&D CAREER OPPORTUNITIES

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BS or MSEE with 3-5 years' experience in digital instrument design; transistor circuit design experience desirable

BS or MSEE with 3-5 years' experience in solid state amplifier design and filter design; antenna experience desirable.

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Sensitive Research Instrument Co. Sorensen

ELECTRONICS LAB. INC.
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PASCAIC, NEW JERSEY
MORE SWINGS

Construction of a 40,000 sq ft addition to the transistor manufacturing and headquarters facility of Fairchild Semiconductor Corporation is scheduled for completion in the fall. The new addition will bring Fairchild’s total office and manufacturing space at 545 Whisman Road to 108,000 sq ft.

J. Murray Hall has joined the engineering department of Lenkurt Electric Co., as an electrical engineer assigned to the firm’s new microwave products project group. Hall previously had been with Canadian Westinghouse Co., Ltd., at Hamilton, Ontario, for eight years. He received his BE in electrical engineering from the University of Saskatchewan, Canada.

Rear Admiral Thomas G. Wallace, USN-retired, has joined the advanced development section of Admiral Corporation in Palo Alto. Prior to retiring, he was supervising inspector of naval material for the central district of the United States with headquarters in Chicago. Prior to being called to active duty in 1941 he was director of industrial engineering and sales for the Southern California Gas Company.

Charles F. Earley has been appointed assistant commercial manager in the advanced systems development division laboratory of International Business Machines Corp., San Jose. He goes to that new assignment from the general products division development laboratory. Earley joined IBM in 1948 in New York City. He came to San Jose five years ago as product planning manager in the general products division development laboratory.

The Heli-Coil Corporation of Danbury, Conn., represented by Premmco Inc., has acquired the Dodge expansion insert, a push-in type of female thread insert for strong threads in plastics and die castings. Premmco Inc. also announces representation for Components Engineering and Manufacturing Co., producing fasteners.

Claire Bell, former general manager of Howell Instruments Inc., Fort Worth, Texas, has joined Varian Associates as manager of instrument product engineering. John F. Moran has been appointed as manager of high-resolution product engineering. Moran joined Varian in 1952 as a junior engineer.

Headed by George Quist, former president of Manderl Industries Inc., a new firm devoted exclusively to ordnance technology, has begun operation in Santa Clara. Principals of the firm called Explosive Technology, are Quist, Dr. Normal R. Zobel, and Frank B. Burk- dell. Zobel was formerly associated with the Poulter Laboratories of Stanford Research Institute.

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34 — grid
LITTON ADVANCED INERTIAL PLATFORM FEATURES TWO UNIQUE, FLOATED TWO-DEGREE-OF-FREEDOM GYROSCOPES

The use of two floated two-degree-of-freedom gyros simplifies the inertial platform, provides higher accuracy and reduced size and weight. Selecting two two-degree-of-freedom gyros as compared to three single-degree-of-freedom gyros was done to increase the accuracy by taking advantage of the larger available space per gyro and to eliminate the undesirable rectification drift inherent in the single-degree-of-freedom gyro platform. It also provided for tighter packaging and simplified design, which contributes to the total platform accuracy, yet permits considerable reduction in size and weight.

To achieve the development of the Litton platform, consideration had to be given to entire new concepts in inertial components, design, packaging, production and testing techniques. Litton developed a unique two-degree-of-freedom gyro measuring three inches in diameter, four inches in length, and weighing only two pounds, that provides a random drift rate capability of less than 0.01 degrees per hour. The two gyroscopes used are packaged in a "dumbbell" configuration which is retained in a four-axis gimbal mechanism. This permits unrestricted angular maneuverability of the vehicle without incurring platform gimbal lock.

Another Litton developed component contributing to the design of the platform is a miniature accelerometer featuring a pendulous torque-balance mechanism. The accelerometer functions by means of external electronic integrating circuitry, thus eliminating the complexity and larger size of internal integrating devices. The use of nonintegrating accelerometers contributes to the compactness and light weight of the platform. The accelerometer measures only 1.00 x 1.135 x 1.80 inches and weighs 7 ounces.

Three identical orthogonally mounted accelerometers are used. The accelerometers, through stabilization signals received from the gyroscopes acting on the platform servos, provide simultaneous measurement of vehicle acceleration along three axes.

If you’re in the inertial or electronic field, it may be that a few of these points have sparked your imagination; it may be that Litton is the place for you to contribute your ideas to advanced projects. Advances in the state-of-the-art in all our areas of interest are lining up chairs of responsibility for the engineer capable of contribution. For the engineer who wants more engineering, less paper work. For the engineer with plans... who wants to see a job through from concept to product.

Our product is inertial equipment, computers, data processing systems, tactical data systems, displays and advanced communications techniques. If working on these kinds of projects and in this kind of atmosphere interests you, write today to Mr. Donald Krause, Research and Engineering Staff, Litton Systems, Inc., 336 No. Foothill Road, Beverly Hills, California.

LITTON SYSTEMS, INC. Beverly Hills, California DIVISION OF LITTON INDUSTRIES
search Institute, and Burkdoll managed the Institute's explosive and propellant test site.

Radiation at Stanford of Palo Alto, a subsidiary of Radiation Incorporated of Melbourne, Florida, has become an associate of the Stanford Research Institute. This brings to 144 the number of individuals and companies that have contributed in this way to domestic and overseas technological development.

Accomplishments of the Polaris and Discoverer programs during 1960 have resulted in selection of the Lockheed missile and space division as winner of the Dr. Robert Hutchings Goddard Memorial Trophy for 1960. The award is for outstanding achievement in the missile and space field.

Reliability and versatility of the Agena space vehicle brought recognition to the U.S. Air Force satellite programs and Lockheed Aircraft Corporation which was awarded the Hoyt S. Vandenberg Trophy for 1960 by the Arnold Air Society at its annual meeting held this year in Detroit. The Vandenberg Trophy is the industrial award made each year to a firm making outstanding contributions "to aerospace power for national security."

James W. Proctor, Jr., formerly sales manager of Diamond National Corporation's wood products division, has been appointed California district manager of Raytheon Company's distributor products division. In his new post, Proctor replaces Allen W. Merriam, Jr., who was recently promoted to western zone manager.

Appointment of Melvin E. Lowe as manager of the reconnaissance systems laboratory at the Mountain View operations of Sylvania Electric Products Inc. has been announced. Lowe previously served as marketing manager of the division's Waltham (Mass.) laboratories, and manager of the missile systems laboratory, a unit of the Waltham laboratories.


IRE MEETINGS SUMMARY

May 16—Instrumentation & Controls Division, San Francisco Section, American Institute of Electrical Engineers: "Power System Control (Including Load Frequency Control)" by John W. Haag, chief engineer, control systems, control division, Minneapolis-Honeywell, Philadelphia, Pennsylvania. 7:30 P.M., Room 4, Crown Zellerbach Bldg., 1 Bush Street, San Francisco, California.

May 23—San Francisco Section, American Institute of Electrical Engineers (Joint meeting with ASME): "Inspection Tour—A Look at Modern Communications" by Laurence G. FitzSimmons, chief engineer, Pacific Telephone Company, San Francisco, California. 8:00 P.M., Engineers' Club, 206 Sansome Street, San Francisco. 5:30 Social Hour, 6:30 Dinner—reservations required.

May 26-27—California Society of Professional Engineers: Annual Meeting Casa Munras Hotel, Monterey, Calif.

August 1-3—Fourth Western Regional Meeting of the American Astronautical Society. Sheraton-Palace Hotel, San Francisco, California.

IRE PAPERS CALLS

June 1—Five copies of 100-word abstracts and five copies of 500-word summaries, together with author’s name, position title, company affiliation, and brief biography, for the Seventh National Communications Symposium (Utica, New York; October 2-4, 1961). Send to: Robert K. Walker, 34 Bolton Road, New Hartford, New York.

June 15—Complete papers or 400- to 500-word abstracts in triplicate, plus 50-word summaries for the 1961 North-East Electronics Research and Engineering Meeting (NEREM) (Boston, Massachusetts; November 14-16, 1961). Send to: F. K. Willenbrack, Pierce Hall, Harvard University, Cambridge 38, Massachusetts.

July 1—Rough drafts and 500-word abstracts for the International Symposium on Aero-Space Nuclear Propulsion face Comm. Eng., Location 1-4, Camden, New Jersey.


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

James A. Ammon
Emmett R. Anderson
Donald G. Benn
Clyde P. Brewer
Edmund J. Burritt
Wilbert H. K. Chang
Lloyd D. Calvin
Richard A. De Kimpoe
Joseph C. Denny
William W. Duvall
Leonard E. Dighton
Herbert A. Finke
Larry L. Hansen
Hiroshi H. Hara
Ronald S. Hawke
James A. Haskett
Geno R. Hickcox
Guilbert C. Hurd
Darrell J. Iverson
Kim Tung Jiew
Everett M. Watt

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

Robert M. Jackson
Frank Klimowski, Jr.
Jay F. Koegle
Peter A. W. Lewis
Wayne V. Magr
John P. Manney
Philip C. Mazzeo
James R. McCaigena
Donald E. McFadna
T. Charles Moore
Manuel R. Morena
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Following are the names of members who have recently been transferred to a higher grade of membership as noted:

MEMBER
Henry M. Buhman
Francis L. Cobb
Vincent J. De Marco
John G. Figueira, Jr.
Druxell D. Foote

MEMBERS
Bobby F. Helm
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Neely Enterprises serves the Electronic Industry with the complete facilities of eight fully-staffed offices and six factory-authorized Service Departments. For over a quarter of a century Neely has grown with the west, and now serves California, Arizona, Nevada and New Mexico with the products of eight leading manufacturers.

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<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Representative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ace Engineering &amp; Mch. Co.</td>
<td>Premmco, Inc.</td>
</tr>
<tr>
<td>Accurate Instrument Co.</td>
<td>Jay Stone &amp; Assoc.</td>
</tr>
<tr>
<td>Adage, Inc.</td>
<td>J. T. Hill Co.</td>
</tr>
<tr>
<td>Airflow Company</td>
<td>Premmco, Inc.</td>
</tr>
<tr>
<td>Analab Instrument Corp.</td>
<td>V. T. Rupp Co.</td>
</tr>
<tr>
<td>Antenna Systems</td>
<td>T. Louis Snitzer Co.</td>
</tr>
<tr>
<td>Antlab, Inc.</td>
<td>Jay Stone &amp; Assoc.</td>
</tr>
<tr>
<td>Baldwin-Lima-Hamilton Corp.</td>
<td>Neely Enterprises</td>
</tr>
<tr>
<td>Beckman/Berkeley Division</td>
<td>V. T. Rupp Co.</td>
</tr>
<tr>
<td>Behlman Engineering Co.</td>
<td>T. Louis Snitzer Co.</td>
</tr>
<tr>
<td>Bogart Microwave</td>
<td>Jay Stone &amp; Assoc.</td>
</tr>
<tr>
<td>Bomac Laboratories, Inc.</td>
<td>Neely Ent.</td>
</tr>
<tr>
<td>Boonton Electronics Corp.</td>
<td>O'Halloran Assoc.</td>
</tr>
<tr>
<td>Communications Control Corp.</td>
<td>T. Louis Snitzer Co.</td>
</tr>
<tr>
<td>Components Engineering &amp; Mfg. Co.</td>
<td>Premmco, Inc.</td>
</tr>
<tr>
<td>Dataplex Corp.</td>
<td>Jay Stone &amp; Assoc.</td>
</tr>
<tr>
<td>Daytronic Corp.</td>
<td>McCarthy Associates</td>
</tr>
<tr>
<td>Di-Tron Corp.</td>
<td>McCarthy Associates</td>
</tr>
<tr>
<td>DuMont Labs, Tubes &amp; Instruments</td>
<td>J. T. Hill Co.</td>
</tr>
<tr>
<td>Dynamics Instrumentation Co.</td>
<td>J. T. Hill Co.</td>
</tr>
<tr>
<td>E-H Research Laboratories, Inc.</td>
<td>V. T. Rupp Co.</td>
</tr>
<tr>
<td>Edgerton, Gershenhausen &amp; Grier, Inc.</td>
<td>J. T. Hill Co.</td>
</tr>
<tr>
<td>Electromagnetics</td>
<td>O'Halloran Associates</td>
</tr>
<tr>
<td>Electronic Associates</td>
<td>O'Halloran Associates</td>
</tr>
<tr>
<td>Electronic Measurements Co.</td>
<td>O'Halloran Associates</td>
</tr>
<tr>
<td>Emerson &amp; Cuming</td>
<td>McCarthy Assoc.</td>
</tr>
<tr>
<td>Franklin Electronics, Inc.</td>
<td>T. Louis Snitzer Co.</td>
</tr>
<tr>
<td>General Communication</td>
<td>T. Louis Snitzer Co.</td>
</tr>
<tr>
<td>Genesys</td>
<td>O'Halloran Assoc.</td>
</tr>
<tr>
<td>Glass-Tite Industries</td>
<td>Jay Stone &amp; Assoc.</td>
</tr>
<tr>
<td>Hamner Electronics</td>
<td>McCarthy Associates</td>
</tr>
<tr>
<td>Hathaway Denver</td>
<td>J. T. Hill Co.</td>
</tr>
<tr>
<td>Heli-Coil Corp.</td>
<td>Premmco, Inc.</td>
</tr>
<tr>
<td>Hewlett-Packard Company</td>
<td>Neely Enterprises</td>
</tr>
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<tr>
<th>Manufacturer</th>
<th>Representative</th>
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<tbody>
<tr>
<td>Huggins Labs., Inc.</td>
<td>O'Halloran Assoc.</td>
</tr>
<tr>
<td>Hughes Aircraft Co.</td>
<td>McCarthy Associates</td>
</tr>
<tr>
<td>Jerrold Electronics</td>
<td>Instruments for Measurements</td>
</tr>
<tr>
<td>Kauke and Co., Inc.</td>
<td>Jay Stone &amp; Assoc.</td>
</tr>
<tr>
<td>Keithley Instruments</td>
<td>T. Louis Snitzer Co.</td>
</tr>
<tr>
<td>Keppco, Inc.</td>
<td>V. T. Rupp Co.</td>
</tr>
<tr>
<td>Kin Tel.</td>
<td>Neely Enterprises</td>
</tr>
<tr>
<td>Laboratory for Electronics</td>
<td>O'Halloran Assoc.</td>
</tr>
<tr>
<td>Lindsay Structures</td>
<td>Premmco, Inc.</td>
</tr>
<tr>
<td>Magnetic Amplifiers (Siegler)</td>
<td>O'Halloran Assoc.</td>
</tr>
<tr>
<td>Massa Div., Cohu Electronics</td>
<td>McCarthy Assoc.</td>
</tr>
<tr>
<td>Menlo Park Engineering</td>
<td>O'Halloran Assoc.</td>
</tr>
<tr>
<td>Microwave Associates</td>
<td>T. Louis Snitzer Co.</td>
</tr>
<tr>
<td>Microwave Dynamics Corp.</td>
<td>Jay Stone &amp; Assoc.</td>
</tr>
<tr>
<td>Microwave Electronics Corp.</td>
<td>Jay Stone &amp; Assoc.</td>
</tr>
<tr>
<td>Millivac Instrument Div., Cohu</td>
<td>McCarthy Assoc.</td>
</tr>
<tr>
<td>F. L. Moseley Co.</td>
<td>Neely Enterprises</td>
</tr>
<tr>
<td>Narda Microwave Corp.</td>
<td>O'Halloran Assoc.</td>
</tr>
<tr>
<td>Norwood Unit-American Standard</td>
<td>J. T. Hill Co.</td>
</tr>
<tr>
<td>Optimized Devices</td>
<td>O'Halloran Associates</td>
</tr>
<tr>
<td>Pacific Electro Magnetics Co.</td>
<td>T. Louis Snitzer Co.</td>
</tr>
<tr>
<td>Polarad Electronics</td>
<td>T. Louis Snitzer Co.</td>
</tr>
<tr>
<td>Quantech Labs</td>
<td>Jay Stone &amp; Associates</td>
</tr>
<tr>
<td>Radiation at Stanford</td>
<td>O'Halloran Assoc.</td>
</tr>
<tr>
<td>Sanborn Company</td>
<td>Neely Enterprises</td>
</tr>
<tr>
<td>Scientific-Atlanta, Inc.</td>
<td>Jay Stone &amp; Assoc.</td>
</tr>
<tr>
<td>Sensitive Research Instrument Associates</td>
<td>McCarthy Assoc.</td>
</tr>
<tr>
<td>Sierra Electronic Corp.</td>
<td>T. Louis Snitzer Co.</td>
</tr>
<tr>
<td>Sorensen &amp; Co., Inc.</td>
<td>McCarthy Assoc.</td>
</tr>
<tr>
<td>Sperry Microwave Electronics Co.</td>
<td>J. T. Hill Co.</td>
</tr>
<tr>
<td>Technibilt Corp.</td>
<td>J. T. Hill Co.</td>
</tr>
<tr>
<td>Tele-Instrument Electronics</td>
<td>O'Halloran Associates</td>
</tr>
<tr>
<td>Telonic Industries</td>
<td>O'Halloran Associates</td>
</tr>
<tr>
<td>Trygon Electronics, Inc.</td>
<td>T. Louis Snitzer Co.</td>
</tr>
<tr>
<td>Varian Associates</td>
<td>Neely Enterprises</td>
</tr>
<tr>
<td>Wiancko Engineering Co.</td>
<td>V. T. Rupp Co.</td>
</tr>
<tr>
<td>Wilton Co.</td>
<td>O'Halloran Assoc.</td>
</tr>
<tr>
<td>Wincharger Corp. (Zenith Radio Corp.)</td>
<td>Premmco, Inc.</td>
</tr>
</tbody>
</table>

INDEX TO ADVERTISERS

Ad-Yu Electronics Lab., Inc. 33
Arnold Engineering Co. 3
Ballantine Laboratories 37
Cetron Electronic Corporation 32
Christie Electric Corp. 26
Columbia Technical Corp. 37
Demornay-Benzarti 27
Donner Scientific Co. 32
du Pont de Nemours & Co. (Inc.), E. I. 11
Electro Scientific Industries, Inc. 29
Fluke Mfg. Co., John 9
General Radio Co. 42
Gertsch Products, Inc. 41
Hewlett-Packard Co. 20
Hill Co., J. T., 1682 Laurel, San Carlos; LY 3-7693 30
Huggins Laboratories, Inc. 21
Hughes Aircraft Co. 17
Kay Electric Co. 31
Lindgren & Assoc., Eric A. 24
Litton Systems, Inc. 35
McCarthy Assoc., 635 Oak Grove, Menlo Park; Davenport 6-7937 33, 40
Miller Co., J. W. 39
Neely Enterprises, 501 Laurel, San Carlos; LY 1-2626; 1317-15th St., Sacramento, GL 2-8901 39, 40
O'Halloran, John Francis & Associates, 825 San Antonio, Palo Alto; Davenport 6-1493 26, 40
Perkin Electronics Corp. 20
Permanent Employment Agency 37
Premmco, Inc., 2406 Lincoln, Alameda; LA 3-9495 40
Radio Corporation of America 15, 22
Rantec Corp. 28, 29
Rupp Co., V. T., 1182 Los Altos Ave., Los Altos; Whitecliff 8-1483 40
Servo Corp. of America 24
Snitzer Co., T. L., 510 So. Mathilda Ave., Sunnyvale; Regent 6-6733 40
Space Technology Laboratories 27
Stone & Associates, Jay, Box 583, Sunnyvale; Whitecliff 8-2770 40
Sylvania Lighting Products 32
Symtron-Donner Corp. 24
Tech-Sci, Inc. 22
Tektronix, Inc. 25
Tung-Sol Electric Inc. 18
Van Groso Co. 38
Varian Associates 2
Western Gold & Platinum Co. 34

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