

EDITOR'S PROFILE of this issue

from a historical perspective ...

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

March 15, 1962:

Cover: Lockheed Missiles and Space discusses large directional radio antennas to track space vehicles; this one has a steerable beam above a fixed dish, for 120 degrees of beam steering. Also covered (p. 12) are unfurlable antennas for spacecraft, such as the rose-petal parabola. Some can be inflated into position through use of gas pressure. A before-and-after picture is shown.

p. 6: The Principles of Consolidation for the merger of the IRE and the AIEE are presented. The Region 7 considerations seem to be well understood, and the overlap between IRE and AIEE are getting more pronounced year by year, causing considerable negotiations and accommodations. AIEE is the older, more-conservative, more prestigious group; the IRE is vigorous, dynamic, strong and expanding. The promise is to leave as much control as possible to the Sections and local decisions, as it has been in the IRE.

p. 10: A meeting on PERT – Program Evaluation and Review Technique – discusses how it was started in 1955 by the US Navy; the Polaris missile program began using it in 1958. By saving an estimated 2 years, it proved its worth. It is now being adopted by many government and military programs. A figure shows a circular sliderule for use with PERT that estimates the time required for a project.



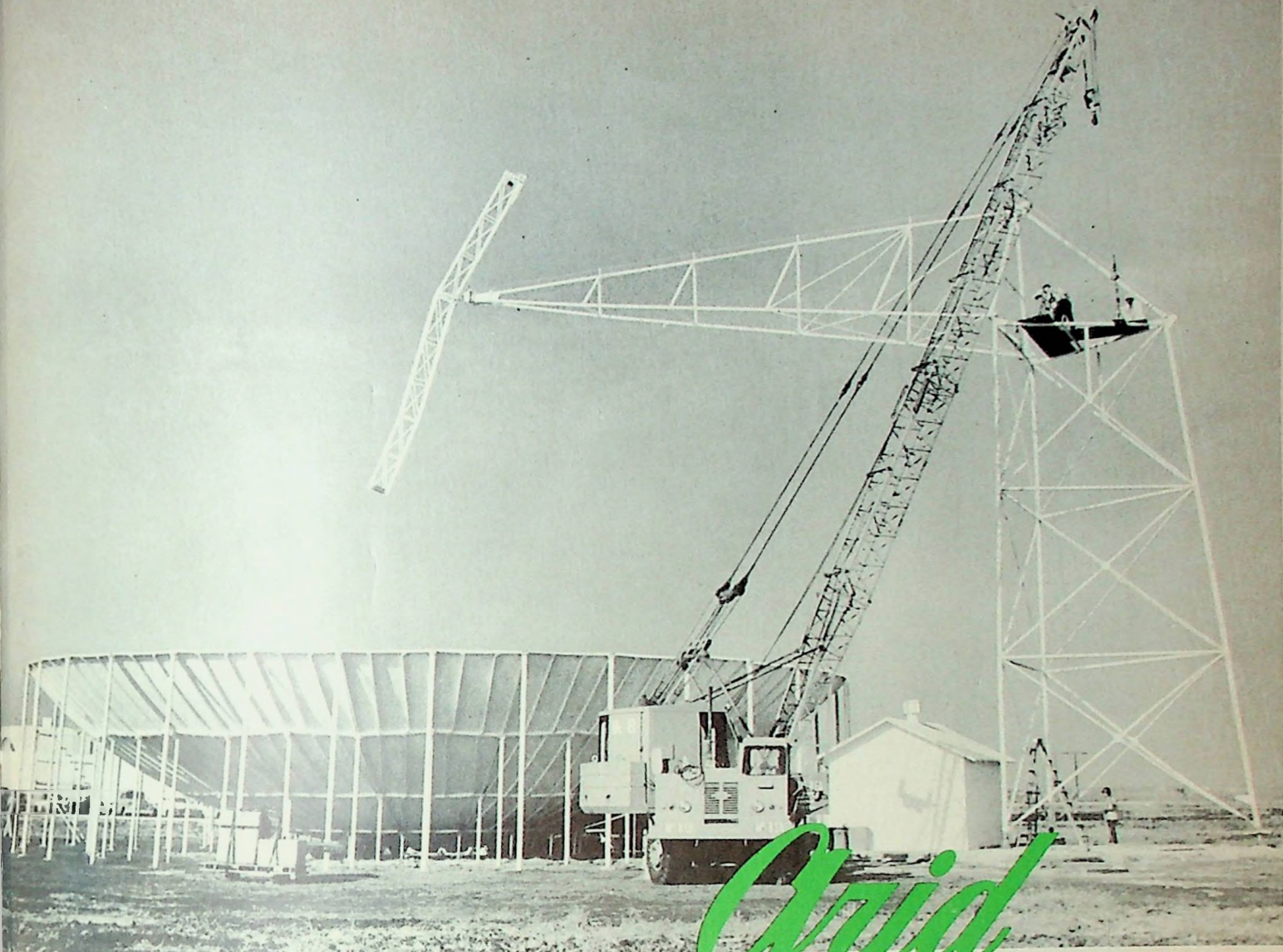
Archive of available SF Bay Area GRID Magazines is at this location:

https://ethw.org/IEEE_San_Francisco_Bay_Area_Council_History

At time of scanning, the bound volumes are held by Paul Wesling.

January, 2021

Contact p.wesling@ieee.org



Grid

March 15, 1962

SAN FRANCISCO



SECTION

IREminder

- March 20 (Tuesday) PGBME, PGSET
- March 21 (Wednesday) PGEWS, PGI, PGRQC
- March 27 (Tuesday) PGEC
- March 28 (Wednesday) PGCS
- April 18-19 (Wednesday-Thursday) PGMIL
- April 25 (Wednesday) PGI
- May 11-12 (Friday-Saturday) PGRQC
- May 23 (Wednesday) PGI
- June 27 (Wednesday) PGI



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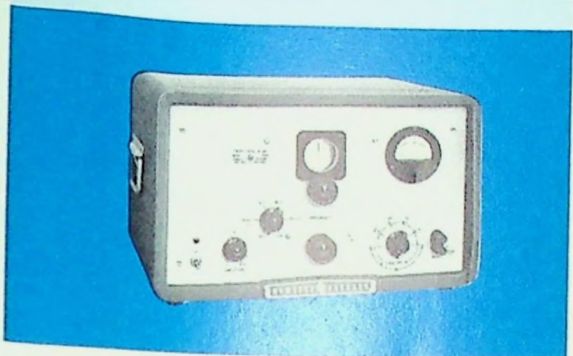


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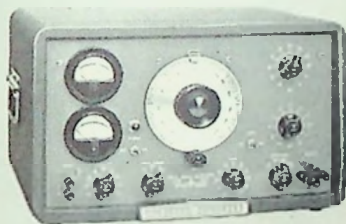
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Price: \$800.00 (cabinet model), \$785.00 (rack mount).

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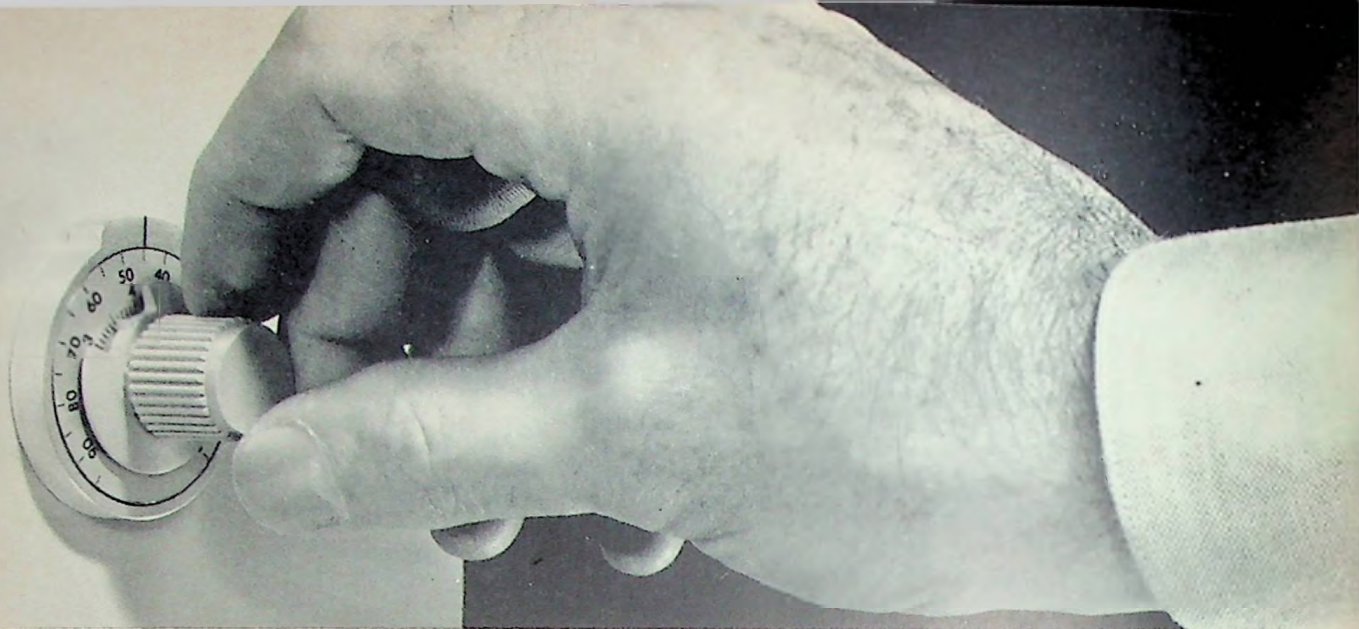


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volume 8

number 8

Grid

March 15, 1962

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cover

View of the Lockheed 85-ft ground-borne dish that was the subject of one of the two presentations at the February meeting of the Professional Group

Chapter on Space Electronics & Telemetry. A review of that meeting is on page 12.

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*Joint statement to IRE National President P. E. Haggerty
from Los Angeles and San Francisco Sections*



remarks from the chair

PROGRESS REPORT

Following several favorable votes on the IRE-AIEE consolidation, your Operating Committee became concerned early in February with the effect of the merger on the unique relationships of the SF and LA Sections, the 7th Region, and WEMA through Wescon. The adjoining joint statement from the two Sections was sent to President Haggerty at the same time that he requested representatives of the Sections, the Region, WEMA, and Wescon to meet with him in Dallas.

San Francisco was represented there by John V. N. Granger, whose report on the Dallas meeting follows. Dr. Granger had previously expressed his personal skepticism in a letter to the national president. Haggerty's reply, excerpted herewith, has considerably allayed concern about the consolidation.

Members are urged to study this exchange and to note that the Principles of Consolidation and related material will appear in March Proceedings, followed by the new Constitution and Bylaws and a good deal of correspondence in the April Proceedings. About ten days later, the San Francisco Section will meet, on April 26, to provide a forum for full discussion before mailing their ballots prior to July 1. All of the material quoted here will be available in full mimeo form from the Section office.

Stanley F. Kaisel

—STANLEY F. KAISEL
CHAIRMAN, SAN FRANCISCO SECTION

The following points require further clarification to permit a satisfactory resolution of the merger question.

1) **Information.** Up to the present time, information presented to the general membership is not adequate to permit a sound judgment regarding advantages to the IRE, its members, or to the engineering profession, of merger with the AIEE.

2) **Timing.** Since the general membership will not have the proposed articles of incorporation, including the constitution and bylaws, before the contemplated voting period, and since major membership areas have not had representation in formative discussions, it is recommended that members not be requested to vote until a draft of the proposed articles of incorporation, including the constitution and bylaws, has been made available for their review and comment for at least 90 days.

3) **Representation.** We recommend that the present eight-man merger committee and its study committees be increased to represent properly a true cross-section of the major activities and memberships of the two societies.

4) **Special Problems.** The merger committee should give detailed consideration to the specific problems resulting from the merger relative to each section and region.

A) **Wescon.** For example, the Los Angeles and San Francisco Sections have a long-standing history of Wescon co-sponsorship resulting in extensive and complex legal and operational inter-relationships and obligations which must be recognized and preserved with minimal modification to preserve our equity in participation and benefits and to avoid the introduction of any element of conflict or incompatibility with our co-sponsors, WEMA and the Seventh Region, IRE.

B) **Boundaries.** Regional boundaries should be established to provide for representation in relation to membership population as well as geographical location on a consistent basis.

C) **Local Operations.** Other problems include consideration of professional group symposia and conventions, operation of section business offices, publication of Section magazines and bulletins, and impact of merger on Section finances.

2-26-62

*Haggerty, in wire of response to query
by WEMA President William J. Miller*

NO DISCUSSIONS TO DATE HAVE CONTEMPLATED INTERFERENCE WITH PRESENT WESCON APPROACH OR PROCEDURE FOR WHICH WE HAVE HIGHEST ADMIRATION. BELIEVE YOUR CONTRACT ACTUALLY WITH LOS ANGELES AND SAN FRANCISCO SECTIONS RATHER THAN SEVENTH REGION. MERGED SOCIETY WOULD, OF COURSE, HONOR CONTRACTUAL COMMITMENTS BOTH SOCIETIES.

Bruce Angwin, Walter Peterson, and I, representing Wescon and the Los Angeles and San Francisco Sections, met in Dallas with President Haggerty and 7th Region Director Reynolds to discuss at very considerable length the various points raised in the joint memorandum. Haggerty impressed us all with his objectivity and sincerity, and with the amount of careful study he had given to every aspect of the proposed consolidation. Taking points of the memorandum in order, Haggerty's principal comments follow:

1) **Information.** Information to the membership before ballots are mailed will include: Principles of Consolidation, Constitution, Past President Berkner's three letters, Haggerty's letter of February 5, a digest of the open panel discussions at the New York Convention, and four or five of the principal critical letters received, together with Haggerty's replies.

2) **Timing.** Principles of Consolidation will be published in March Proceedings. This is the significant statement of the proposal since the Constitution is purposely broad. If the schedule described in Haggerty's letter of February 5 is adopted by the two boards, ballots need not be returned until 60 days later.

3) **Representation.** If the Board adopts the Principles of Consolidation on March 8, the eight-man merger committee will be increased to fourteen members and the study committee on meetings will be increased to include Wescon representation.

4) **Special Problems.**

A) **Wescon.** The IEEE would accept the contract responsibility as regards Wescon now held by the IRE. The IEEE would embody the same principles of local autonomy and self-determination that characterize the IRE, and would encourage, in every possible way, the present IRE sponsors to carry Wescon forward in partnership with WEMA. IRE legal counsel is reviewing the Wescon agreements to ensure against interference with Wescon.

B) **Boundaries.** Haggerty recognizes that the present IRE situation, where one regional director represents 22 per cent of the membership in the case of the 7th Region, is inequitable and is willing to recommend a change in boundaries. On the course of intensive discussion on this point, the group present agreed that, in their personal view, the close community of interest of the 7th Region, particularly as regards Wescon, outweighed purely numerical considerations and that boundaries should not be changed. It was pointed out also that historically (and at the present) the proportion of the directors at large resident in the West was great enough to more than redress the per-capita balance of representation.

C) **Local Operations.** On the final point, Haggerty was aware of, and sympathetic to, these special problems. Again he pressed the fact that the structure of the IEEE was deliberately set so as to continue the same degree of local autonomy now enjoyed by the IRE sections, regions, and professional groups.

One other agreement was developed, which is of specific interest. In connection with its regular meeting of March 14 in Los Angeles, the Wescon Board has invited the principal representatives of its sponsor organizations (WEMA, the Los Angeles and San Francisco Sections, and the 7th Region) to meet with it to review Wescon's own studies of the detailed problems of policy and operation that might be created by consolidation. If, after this meeting, we wish further discussions with the merger committee, or its study groups, prior to the New York Convention, Haggerty will arrange this.

In summary, I am personally convinced that our special concerns and problems are recognized and understood, and that Haggerty and Reynolds are in full sympathy with them. While it is clear that many problems of detail are left to be worked out, I am confident that nothing in the intent or the conclusions of the merger committee will stand in the way of success.

3-1-62

*Quotes, heavily edited because
of space, from Dr. Haggerty's
letter to Dr. Granger*

The question of whether or not a consolidation of IRE and AIEE is, in principle, a desirable move from the IRE standpoint is indeed for us the fundamental question. The results of deliberations can be summarized as concurrence on the part of the representatives of both IRE and AIEE that consolidation was desirable, in principle, if suitable mechanisms for consolidation could be settled upon.

While once IRE and AIEE had relatively little overlap (with AIEE concentrating on power and telephone communications and IRE on radio and what has come to be known as electronics), this is no longer true. There is simply no longer a way of dividing the technological content of electrical engineering between AIEE and IRE. We have approximately 6000 common members, but AIEE has an increasing number of members belonging only to AIEE, but interested primarily in the technological areas IRE has long considered its own. Out of IRE's 217 student branches, 128 are IRE-AIEE student branches. Of 61 national technical meetings sponsored by IRE's professional groups in 1961, AIEE was cosponsor of 22. It becomes difficult indeed to decide to whom magnetohydrodynamics, applied plasma physics, fuel cells, and automatic controls belong. Most of us came to the conclusion that the course of events in our profession was such that the overlaps would go on growing and that the amount of time to be spent in coordinating and cooperating in IRE and AIEE affairs would grow increasingly over the next decade.

If IEEE can provide a stronger unifying force than the IRE and the AIEE can separately, then probably this is the controlling and dominant factor in determining the propriety of the merger of IRE and AIEE. If a merger can be accomplished in accordance with the Principles of Consolidation then IEEE will be a stronger unifying force than the two societies are separately.

The IEEE will have as least as much flexibility and viability as has the IRE.

Your national officers and directors could not hope, if they spent full time from now until January 1, 1963, to resolve the multitude of differences and details which exist at the local level. We must assume, and I think it is reasonable to do so, that the same local groups which have created the strong local organizations can and will solve these problems, given a modest amount of time to do so.

2-24-62

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MEETING CALENDAR

PROFESSIONAL GROUPS

Bio-Medical Electronics

8:00 P.M. • Tuesday, Mar. 20

"DADTA (Discrimination Apparatus for Discrete Trial Analysis)"

Speaker: Dr. Karl Pribram, Stanford Medical School

Place: Room M-112, Medical School Building, Palo Alto-Stanford University Medical Center

Dinner: 6:00 P.M., Red Cottage Restaurant, 1706 El Camino, Menlo Park

Reservations: Ellen Campbell, DA 6-6200, Ext. 3372

Communications Systems

8:00 P.M. • Wednesday, Mar. 28

"An Advanced New Military Multiplexing System—Can It Be Used Economically for Commercial Applications?"

Speaker: Thomas C. Bean, manager of government systems engineering, Lenkurt Electric Co., Inc.

Place: Lenkurt Electric Co., Inc., 1105 County Road, San Carlos

Dinner: 6:30 P.M. (Social Hour 5:30 P.M.), The Gold Platter, 1000 El Camino Real, San Carlos

Electronic Computers

8:00 P.M. • Tuesday, Mar. 27

"Microprogramming and Its Modifications"

Speaker: Dr. H. M. Semarne, consultant for computer systems application

Place: Lockheed Auditorium, 3251 Hanover Street, Palo Alto

Dinner: 6:00 P.M., The Red Shack Hofbrau, 4085 El Camino Way, Palo Alto
Reservations: None required

Engineering Writing & Speech

8:00 P.M. • Wednesday, Mar. 21

(Joint meeting with PGEM)

"PERT (Program Evaluation Reporting Technique), a New and Valuable Management Tool"

Speaker: R. M. T. Young, senior staff specialist, Polaris missile systems project control, Lockheed Missiles and Space Co.

Place: Lockheed Auditorium, 3251 Hanover Street, Palo Alto

Dinner: 6:30 P.M., L'Omelette Restaurant, 4170 El Camino Real, Palo Alto
Reservations: Doris Gould, IRE Section Office, DA 1-1332, by Mar. 20

Instrumentation

8:00 P.M. • Wednesday, Mar. 21*

(First in a series of four meetings)

"Instrumentation in Data Systems—Preliminary Considerations"

Speakers: James R. Cunningham, systems manager, Systron-Donner Corp., and Joseph L. Hussey, consultant

Place: Hewlett-Packard Co., 1501 Page Mill Road, Palo Alto (main lobby)

Meet-the-Speaker Dinner: 6:00 P.M., L'Omelette Restaurant, 4170 El Camino Real, Palo Alto

Reservations: None required

*Note change of date

Instrumentation

8:00 P.M. • Wednesday, Apr. 25

Lecture No. 2

Speakers: To be announced

Place: Hewlett-Packard Co., 1501 Page Mill Road, Palo Alto (main lobby)

Meet-the-Speaker Dinner: 6:00 P.M., L'Omelette Restaurant, 4170 El Camino Real, Palo Alto

Reservations: None required

MEETING CALENDAR

Instrumentation 8:00 P.M. • Wednesday, May 23
 Lecture No. 3
 Speakers: To be announced
 Place: Hewlett-Packard Co., 1501 Page Mill Road, Palo Alto (main lobby)
 Meet-the-Speaker Dinner: 6:00 P.M., L'Omelette Restaurant, 4170 El Camino Real, Palo Alto
 Reservations: None required

Instrumentation 8:00 P.M. • Wednesday, June 27
 Lecture No. 4
 Speakers: To be announced
 Place: Hewlett-Packard Co., 1501 Page Mill Road, Palo Alto (main lobby)
 Meet-the-Speaker Dinner: 6:00 P.M., L'Omelette Restaurant, 4170 El Camino Real, Palo Alto
 Reservations: None required

Military Electronics 8:00 P.M. • Wed., Thurs., April 18, 19
 (Joint meeting with all professional societies)
 "Research in Space"
 Speaker: Lt. Col. Paul L. Maret, Washington office, Air Force Systems Command Headquarters
 Place: Foothill College Auditorium, El Monte Avenue, Los Altos
 Reservations: Secret clearance must be established with Major Herman H. Teifeld, director, Scientific & Technical Liaison Office, Air Force Systems Command, 1176 Los Altos Ave., Los Altos, WH 8-1434

Reliability & Quality Control 8:00 P.M. • Wednesday, Mar. 21
 "Reliability Models for Complex Ground Systems"
 Speaker: K. Hall, development engineer, Sylvania reconnaissance systems laboratory, Mountain View
 Place: Physics Lecture Hall, Stanford University
 Dinner: 6:30 P.M., Chez Yvonne, 1854 El Camino Real, Mountain View
 Reservations: None required

Reliability & Quality Control • Fri., Sat., May 11, 12
 Third Annual Bay Area Reliability Seminar
 (Joint with San Francisco Section and Student Branch U. S. Naval Postgraduate School)
 Seminar: "Today's Reliability Challenge"
 Keynote Speaker: Dr. Landis Gephart, NASA Hdqtrs., Washington, D. C.
 Place: U. S. Naval Postgraduate School, Monterey

Reliability & Quality Control 8:00 P.M. • Friday, May 11
 (Joint with Student Chapter, U. S. Naval Postgraduate School)
 Dinner Meeting
 Speaker: Dr. Royal Weller, director of engineering space-systems division, Lockheed Missiles and Space Co., Sunnyvale, Calif.
 Place: Officers' Club, U. S. Naval Postgraduate School, Monterey, Calif.
 Cocktails: 6:30 P.M. Dinner 8:00 P.M. prime ribs or lobster, \$3.50 in adv.
 Reservations: J. M. Alderman, Arinc Research, 467 Hamilton Ave., Palo Alto, DA 1-0390

Space Electronics & Telemetry 8:00 P.M. • Tuesday, Mar. 20
 "PACM Telemetry"
 Speaker: W. F. Link, Aeronutronic Division of Ford Motor Co., Newport Beach, California
 Place: Lockheed Auditorium, 3251 Hanover Street, Palo Alto
 Dinner: 6:30 P.M., Camino Bowl, 2025 El Camino Real, Mountain View
 Reservations: Cynthia Chaney, DA 6-4350



San Francisco, Calif.
 February 23, 1962

Editor, the Grid,
 Dear Sir:

Merger of AIEE and IRE presents a challenge to the engineering profession. This is a real test for operational talents and statesmanship.

If engineers are afraid of getting "Big," then they are out of step with the nature of things to come and with the magnitude of the engineering tasks ahead of us. IRE alone may exceed, in a very short time, the combined total membership of both organizations today.

The problem is: Can the organizational genius of an engineer adapt itself to new horizons and new conditions? If a problem of merger is too much to handle, then how does the engineering profession expect to find the better, more dignified, and more responsible position in society to which it is entitled by the contributions of individual engineers in the technological pattern of life in the world today?

AIEE is the older more-conservative organization that carries great prestige. IRE is vigorous, dynamic, strong, and rapidly expanding. Merger of the two, if properly executed, should eliminate competition in areas where the two organizations overlap and strengthen their influence in regions where at present there is no conflict.

Beneficial results from the merger may be acquired only if (and that is a BIG IF) every detail and every controversial topic is given due and full con-

(Continued on page 10)



James R. Cunningham, PGI speaker

meeting ahead

SYSTEM ELEMENTS & APPROACHES

PGI kicks off its three-part lecture series in March (see Calendar, page 8) with two speakers, James R. Cunningham and Joseph L. Hussey, covering respectively, the elements and the overall considerations involved in instrumentation systems.

The first section of the meeting will include a discussion of the types of instrumentation required to make simple data systems and also the more complex variety. Cunningham will give a brief description of the various elements of the system, such as: transducers, scanners, converters, recorders, etc. There will be particular reference to commercially available instrumentation.

The second section will deal with the less technical decisions that must be faced by the prospective user. Various approaches toward evaluating the cost-accuracy-speed compromises will be discussed by Hussey. Additionally, compromises between complexity, reliability, and value of results will be covered. Some examples will be given to illustrate the approaches.

Joseph L. Hussey received a BA de-



Joseph L. Hussey, PGI speaker

gree in physics from UCLA. He is presently working as an independent engineering consultant in the area of system design and evaluation. Prior to starting his own business, Hussey was manager of engineering for Beckman Instruments, Berkeley Division, where he was responsible for the design of both analog and digital instrumentation. The Berkeley Division produces digital counting and timing instrumentation (Eput) as well as a large-scale analog computer (Ease). Before joining Beckman Instruments in 1952, he worked for Northrop Aircraft in Hawthorne, California, where he was in charge of the analog simulation facility.

James R. Cunningham is administrative systems manager in the Systron Division of Systron-Donner Corp. His background includes: two years as an electronic technician, USN; University of California, BSEE; two years as a design engineer and application engineer at Berkeley Scientific Co.; three years as sales manager in the systems department at Beckman Instruments, Inc.; and four years as sales manager at the Systron Corp. Systron Division is a manufacturer of timing and recording, automatic-logging, and automatic-checkout systems.

meeting ahead

ONCE MORE—PERT

On March 21, a joint meeting of PGEWS and PGEM (see Calendar) will hear R. M. T. Young speak on "The Pert System of Management," a computerized management tool for network planning and scheduling techniques.

Pert—Program Evaluation and Review Technique—began in 1955 with the Navy's challenge to produce the Polaris missile system in minimum time. Because existing management concepts were considered inadequate to cope with this vastly complicated project, a Navy operations research team sought an entirely new approach to effective management, planning, evaluation, control, and progress measurement.

It was this team that originated Pert and applied it to the Polaris program, beginning in January 1958. Later, as Polaris progressed into preliminary production, Pert was extended into all phases of the program. It has been credited with helping shave two years off the time originally considered necessary to make Polaris operational.

Since 1959, Pert-type systems have attracted widespread interest and have become proposal—as well as contractual—requirements on most major missile, space, and weapon systems, including the construction of launch sites.

In addition, management groups from
(Continued on page 12)

MORE RETURNS

sideration by those who are planning the BIG deal.

The merger is desirable only if both organizations are capable of showing their ability to face up to this great challenge and to the even more complex problems of tomorrow! Let's hope that we engineers have the maturity necessary for such a merger.

The engineering profession must continuously grow—unafraid of new challenges, new conditions, new environments. Science and technology have given us the weapons and tools to accept new responsibilities. Do we have enough good sense and statesmanship to accept the challenge? This is the question and the planned merger may provide us with the answer.

Walter Priese
Mem. AIEE
Sen. Mem. IRE
Chairman, PGMIL,
San Francisco Chapter

Menlo Park, Calif.
February 23, 1962

Editor, the Grid
Dear Sir:

I am strongly in favor of the proposed merger of IRE and AIEE. There is a very large area of overlap in the fields covered by the two societies; for example, magnetic components, industrial controls, and communications are areas in which both societies have been concerned for a long time, and the area of digital computers is of increasing interest to the AIEE, as it has been to IRE. I agree that a 10" dollar industry certainly can support a society devoted to its problems, but I don't agree that it should be asked to support two overlapping and sometimes conflicting societies. It seems to me that if the two societies, having come this far, do fail to complete the merger, it will be a fair indication that neither one is capable of understanding and representing the larger interests of the electromagnetic engineering profession, and therefore that neither one is worthy of further support.

Very truly yours,
P. Roger Gillette

Cupertino, Calif.
February 18, 1962

Editor, the Grid,
Dear Sir:

Ref.: Merger—
Emphatically, No!

Kenneth B. Patterson
Past Chairman, PGCS,
San Francisco Chapter
Mem. Adcom PGCS

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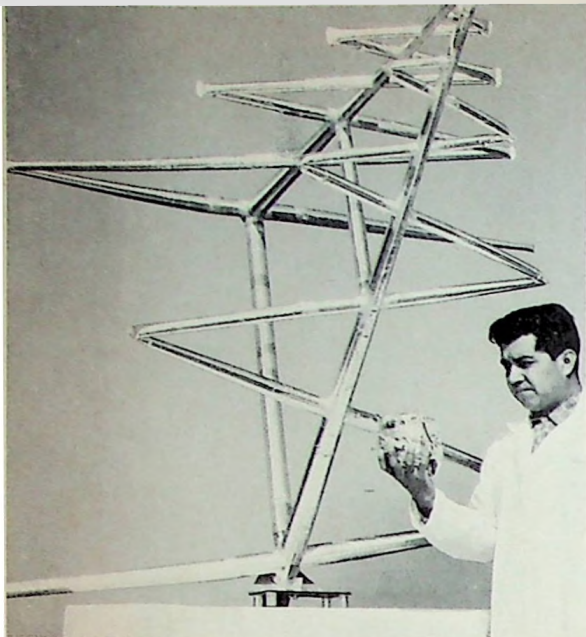
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Example of one of the unfurlable antennas described at the February PGSET meeting, before and after erection

MORE PERT

Harvard, MIT, Aerospace Corporation, many major defense industries, the Army, Navy, and Air Force, NASA, and the Treasury Department are now using all or part of the Pert concept to advance their own management systems.

The speaker, Richard M. T. Young, is a senior staff specialist in project control for Polaris missile systems at Lockheed where he is active in implementing Pert. For five years prior to joining Lockheed, Young was a supervisory military analyst and acting technical director in the office of the U. S. Army quartermaster general. Educated as a metallurgical engineer, Young has held several positions related to development of process and project control.

—DOUGLAS WM. DUPEN

meeting ahead

HYBRID TELEMETRY

In March, "PACM Telemetry" will be the subject of the PGSET meeting and the speaker will be W. F. Link of the Aeronutronic Div., Ford Motor Co., Newport Beach, Calif. For details, see the Calendar, page 9.

PACM is a hybrid telemetry system that allows the combination of pam and pcm on a single r-f carrier in handling diverse data signals. The system was proposed two years ago as the outgrowth of a study program of problem areas in telemetry. An experimental system has been developed and is being evaluated under Air Force contract.

This talk by Link will describe the advantages that relate to the pacm concept and the equipment that has been developed, and will offer conclusions

regarding its potential usefulness.

Link has been with the Aeronutronic Division of Ford in Newport Beach for four years. Much of his time has been spent on the telemetry study and pacm development this talk summarizes.

He obtained his BS and MS degrees in electrical engineering at Washington University, remaining there for two years as an instructor in radio engineering, and working for the University research foundation. After leaving the University he spent six years in telemetry systems design and airborne and ground-station component development at NAMTC, Point Mugu, Bendix Aviation; and Lockheed Missiles & Space Co.

meeting review

ANTENNAS: HITHER & YON

Dr. Peter Kennedy and Robert Trainer of Lockheed Missiles and Space presented two very interesting discussions on antennas for deep-space programs at the February meeting of PGSET. Kennedy described unfurling space-vehicle directional antennas, and Trainer told of design considerations of large ground antennas.

To date, space-vehicle antennas have been of the omnidirectional type. The nondirectional antenna is used when the flight attitude of the space vehicles cannot be predicted or controlled. The newer and larger vehicles do provide attitude control and so directional antennas become of interest. The radio-beam steering required when using directional antennas is accomplished mechanically since the speed of electrical steering is not required.

Mechanical beam control suggests at least three major problems: (1) inertial reaction between the moving parts and the vehicle, (2) mechanical drive power, and (3) lubrication. Suitable design of the antenna moving mechanism can provide a net zero inertial reaction force. Calculations show that the power required to keep the antenna on the earth target with the vehicle 300 miles above the earth is less than one watt. Lubrication is provided by low-vapor-pressure lubricant in a nonsealed closure. Bushings with 0.001-in. clearance provide small probability for escape of lubricant molecules.

Since directional antennas are rather bulky they must remain furled until the vehicle leaves the atmosphere. An example of a mechanical assembly is the rose-petal parabola, which is held closed by a restraining cord and upon release flipped into position through the use of hinges, springs, and cables. The unfurled to furled ratio of the mechanical antennas is poor when compared to pressure-erection types.

These types are constructed of aluminum foil and Mylar and rolled and folded into a very small package. Gas is used to erect these antennas. When the antenna is erected the gas pressure is released and the antenna holds its shape. The elements remain depressurized after inflation in order to eliminate the problem of explosion when the antenna has been punctured by particles it may encounter in space. A number of antenna types have been made by this method; they have very good radiation properties and the mechanical properties closely resemble those of thin-wall members. This is more than adequate for their service.

The essential steps in using a pressure-erection antenna are: to keep external pressure greater than internal pressure before erection, to release gas at a proper rate and pressure during erection, and to release the gas pressure upon erection.

Trainer gave a down-to-earth discussion of advantages and problems of the spherical-reflector antenna. Requirements for high antenna gain have resulted in very large units. It is estimated that the size limit for a steerable parabola is about an 800-ft diameter. These units, in addition to steering, must be

(Continued on page 14)

7th region news

SEATTLE: FAIR AND WISE

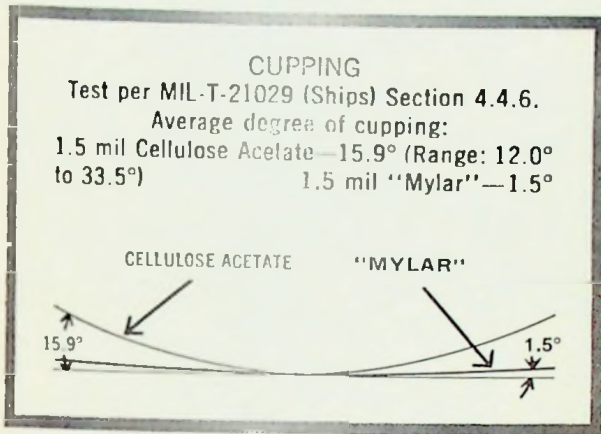
An industrious group of Seattle IRE Section members are meeting weekly to plan the 1962 Seventh Region Conference, to be held May 24-26 in the Century 21 city of the northwest. The committee is headed by Leroy C. Perkins, who is chief for electronics and guidance of the Dynasoar project at Boeing.

By the time of the conference Century 21 will be well under way (opening date is April 21). Visitors to the conference will have an opportunity to see the big World's Fair as well as attend the well-planned technical program.

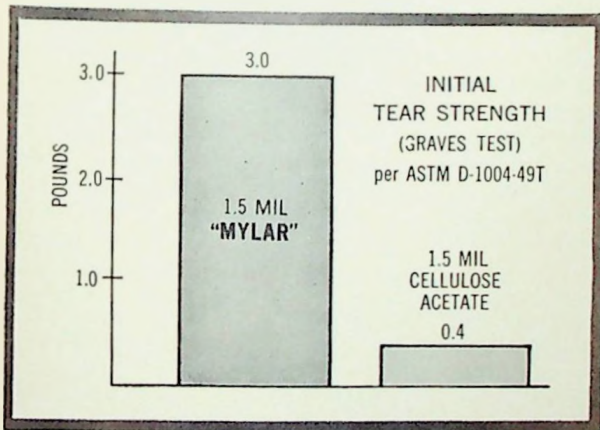
Sessions will tie in with both the Century 21 theme and the 50th anniversary of the IRE being celebrated this year. Views on the role of electronics in the year 2012—fifty years from now—will be expressed. Space experiments, radio astronomy and stellar noise, satellite communications, and propagation and ionospheric physics are some of the topics to be covered. Another group of sessions will cover antennas, devices, packaging and adaptive design, primary power, and radiation effects.

The Wescon board of directors, as well as the national IRE board, will meet in Seattle during the conference. Early reservations are suggested since hotel space is limited due to Century 21.

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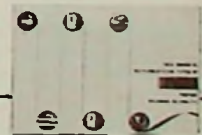
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Schematic view of the West Ford experiment discussed at the January meeting of PGIT—Lincoln Laboratory photo

MORE ANTENNAS

able to withstand the usual abuses of nature and these requirements present very serious problems.

Therefore, a hemispherical antenna that is mounted on the ground is proposed. The relatively lightweight feed moves above it in order to steer the beam. Since the antenna is spherical and rigidly mounted to the ground it is relatively simple to construct and align. The antenna does produce spherical aberration, but, if serious, this can be corrected by one of several shapes of secondary reflectors near the focal point. Beam steering is accomplished by moving the feed and second reflector, thus producing 120 degrees of beam steering.

Lockheed is now testing a spherical antenna with a 60-ft radius of curvature and 85-ft diameter. This will provide a 30-degree steering angle with 120 degrees available when the 60-ft hemisphere is completed. It took only two man days to align the antenna panels to 0.020 inches. Hemispherical antennas have many advantages, including: Low cost, no weight problem in the reflector, all-steel construction, no distortion due to wind and sag, simple drive for feed (due to light weight), low noise temperature (shielded at a low angle), and a simple surface to align.

—JOSEPH W. BARKLEY

meeting review

DIPOLE FLAKE-OUT

Dr. Robert Lerner of Lincoln Laboratory, addressed the meeting of PGIT in January on the subject, "Project West Ford." The meeting was held at Stanford Research Institute, with an audience of 34 present.

Lerner first pointed out the need for

a very-reliable low-data-rate global communication channel for diplomatic, political, and military use. All present channels and the various proposed satellite systems are vulnerable to electronic countermeasures, natural interference, and physical attack. To meet this need, Lincoln Laboratory has proposed a belt of orbiting dipoles to form an artificial ionosphere providing several hundred square meters of scattering cross section.

At an altitude of 4000 miles, such a belt could provide communication circuits up to a 10,000-mile range and two



R. M. Lerner, speaking to PGIT on Project West Ford

—James J. Spilker, Jr., photo

such belts, one polar and one equatorial, would provide global coverage. This system would be immune to physical attack, and communication between two terminals can be accomplished by using any point on the belt that is in common view of the two stations; hence, a countermeasures transmitter does not know where to direct jamming power, in contrast to the case of jamming an Echo satellite system, for instance.

This link is subject to path loss that varies as the third power to the first power of range, depending on the extent to which the belt lies within the angular aperture of the antenna. Thus it is important to have high-gain antennas, a large dipole-scattering cross section, and low noise. The first factor calls for higher frequencies, and the second factor is relatively invariant with respect to frequency. However, the third calls for lower frequencies because of noise contributed by the atmosphere. These considerations led to a choice of 8 gc.

Details of the dipole design are influenced by a number of factors. Dipole length is, of course, fixed by frequency. The diameter must be large enough to provide adequate skin depth and large enough to keep the area-to-mass ratio below the level where solar radiation

pressure is serious. A diameter of 0.0029 centimeters was chosen. For this size, 350 million dipoles weigh 75 lb.

All experiments involve some hazards, and West Ford is not an exception. In the experimental belt, the dipoles have an average separation of 370 meters and a density of only 21 dipoles per cubic kilometer. Hence the probability of a destructive collision with a spacecraft is negligible. The visual glow from the belt is two orders of magnitude below the glow of the night sky. The radio astronomer, if he is unable to use range gating, will suffer an increase of a few db of noise only when he is looking directly through the belt. Thus, according to Lerner, all unemotional analyses of the project show no known hazards. There is, of course, as in all new concepts, some possibility of unknown phenomena.

An operational West Ford system will require about ten times more dipoles. Such a belt will be spread by micrometeorite collisions over a period of centuries. A finite life could be obtained by using doped tin dipoles which, after a pre-determined time, crumble to dust and are returned to earth by solar radiation pressure.

The dipole belt has an initial radial dimension of approximately 40 kilometers and a transverse dimension of approximately 10 kilometers. The channel is time varying with a doppler spread of hundreds of cycles per second, and a time multipath up to a millisecond due to the radial depth of the belt. The behavior of, and our ability to analyze, time-varying channels seems to be measured by the product of the fading rate and the multipath. Several systems are compared in this table:

	Fading rate, cps	Multipath, μ sec	Product
H-F Link	0.1-1	1000-10,000	$10^{-1}-10^2$
Ionosphere scatter	1-10	100-1000	$10^{-1}-10^3$
Troposphere scatter	1-10	0.3-3	$3 \times 10^{-6}-3 \times 10^{-1}$
West Ford	100-1000	100-1000	$10^{-2}-1$

When the fading rate-multipath product equals or exceeds unity, a channel is called "over-spread" or "pathological." At the present state of the theory of such channels, it is not clear to what extent it is possible to obtain coherent reception through them. However, a combination of a radiometer receiver, frequency-shift keying, and frequency hopping can provide communication over even a pathological link. The first bit is transmitted as energy at frequency f_1 if it is a one or at f_2 if it is a zero, the second bit is then transmitted on f_3 or f_4 before the first bit has been completely received, etc. The frequency sep-

(Continued on page 16)



To the electro/mechanical development engineer who's realizing only part of his potential

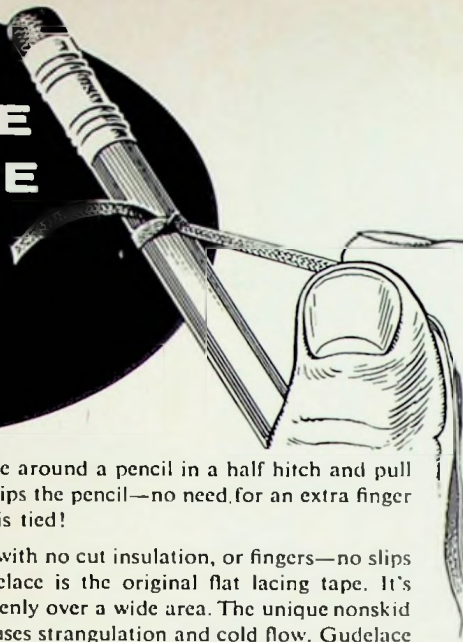
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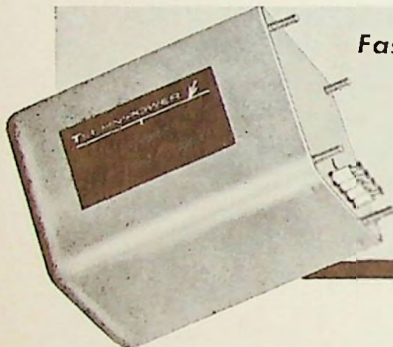
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MORE WEST FORD

ations are all greater than the doppler spread.

Lerner then played a tape recording of speech which had been reflected from the cold side of the moon which is subject to about 600 μ sec multipath. The baseband was 2400 cps sampled at 5000 per second. Each sample was quantized into one of sixteen equiprobable levels giving 20,000 bits per second or 50 μ sec per bit. The minimum number of frequencies would then be $2 \times 600/50 = 24$. The voice quality of the recording was good and certainly demonstrated validity of the concept.

Lincoln Laboratory also plans to record cross correlations between transmitted and received maximal-length pseudo-random binary sequences ± 90 deg phase modulated on a single frequency. It is hoped that analysis of these recordings will help to characterize the channel and advance the theory of nearly overspread and overspread.

The first attempt to establish an orbital belt was not successful, probably because the naphthalene-bonded dipole package did not dispense. The causes of this failure are under investigation.

—CHARLES H. DAWSON

meeting review

GENERATING MILLIMETER POWER

The joint meeting of PGMTT, PGAP, and PGED at Stanford on February 15 heard the first of four tutorial lectures about millimeter waves. Wesley Teich of Raytheon Spencer Laboratory discussed the present capabilities of millimeter-wave vacuum tubes and some possible advances for the future. John Skowron, also of Raytheon, presented a proposed design for a very-high-power amplifier. This device, called an electromagnetic amplifying lens (eal) was first suggested by William Brown of Raytheon.

The millimeter wave region is loosely defined as extending from 50 gc to 1000 gc, or between K_u band and the infrared region. When compared with the usual microwave frequencies, millimeter waves can provide very wide bandwidths, extremely high directivity and resolution, and small size. In addition, the region exhibits some interesting absorption phenomena that can sometimes be used to advantage. These characteristics are useful in some kinds of radar and communication systems as well as more specialized fields such as spectroscopy and weather mapping. Because of molecular absorption characteristics, systems designed to work in the atmosphere must work at "window" frequencies centered around 85, 140, 300, and 600 gc.

(Continued on page 18)

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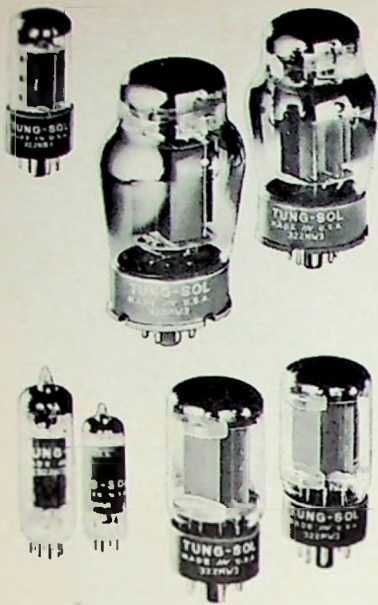
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Commercially available klystrons and backward-wave oscillators provide signal sources as high as 140 gc, and experimental carcinotrons have operated up to 450 gc. For pulsed power work, the magnetron is useful to 95 gc. At 95 gc and below it can produce peak powers of 1 to 100 kw and average powers of a few watts.

Microwave tubes can be broken into three major classes: beam tubes (such as klystrons and traveling-wave tubes), crossed-field injected-beam tubes (magnetrons), and crossed-field continuous-cathode tubes (amplitrons). Each of these types presents problems of circuit fabrication and circuit loss at millimeter wave frequencies, but each also has certain advantages and disadvantages peculiar to its type. Beam tubes have the advantage of the various functions being separated physically, allowing the designer to consider each part by itself. There are serious problems, though, in forming beams of sufficient energy density, and it also becomes more difficult to couple to the beam at higher frequencies.

The cross-field devices offer much better efficiency than the beam tubes, but the necessary magnetic field increases linearly with frequency, and heat dissipation is a problem. The injected-beam

tube suffers the same difficulties with beam-energy density as does the beam tube, and cathode dissipation is a problem in the continuous-cathode tube. All three kinds of tubes will benefit to a marked degree from advances in either cathode emission or magnet design.

Brown has proposed a different structure to provide high power at the millimeter-wave frequencies. It would use a fast-wave structure and crossed electromagnetic fields to obtain high power, and this would be augmented by essentially operating a large number of simple amplifiers in parallel. The resulting electromagnetic amplifying lens consists of a number of parallel waveguides leading from a common source to a crossed-field interaction region. Phase shift differs by 180 deg in adjacent guides, and the resultant fields create a pi mode, similar to that in a magnetron, at the interaction region. The amplified signal leaves the crossed-field region through another set of parallel waveguides that restore the phase and lead to a common output.

Calculations suggest that the eal can produce average power of the order of 100 kilowatts with 20 db of gain. This would require a magnetic field of 20,000 gauss, perhaps obtained from a superconducting solenoid. As with all

(Continued on page 20)

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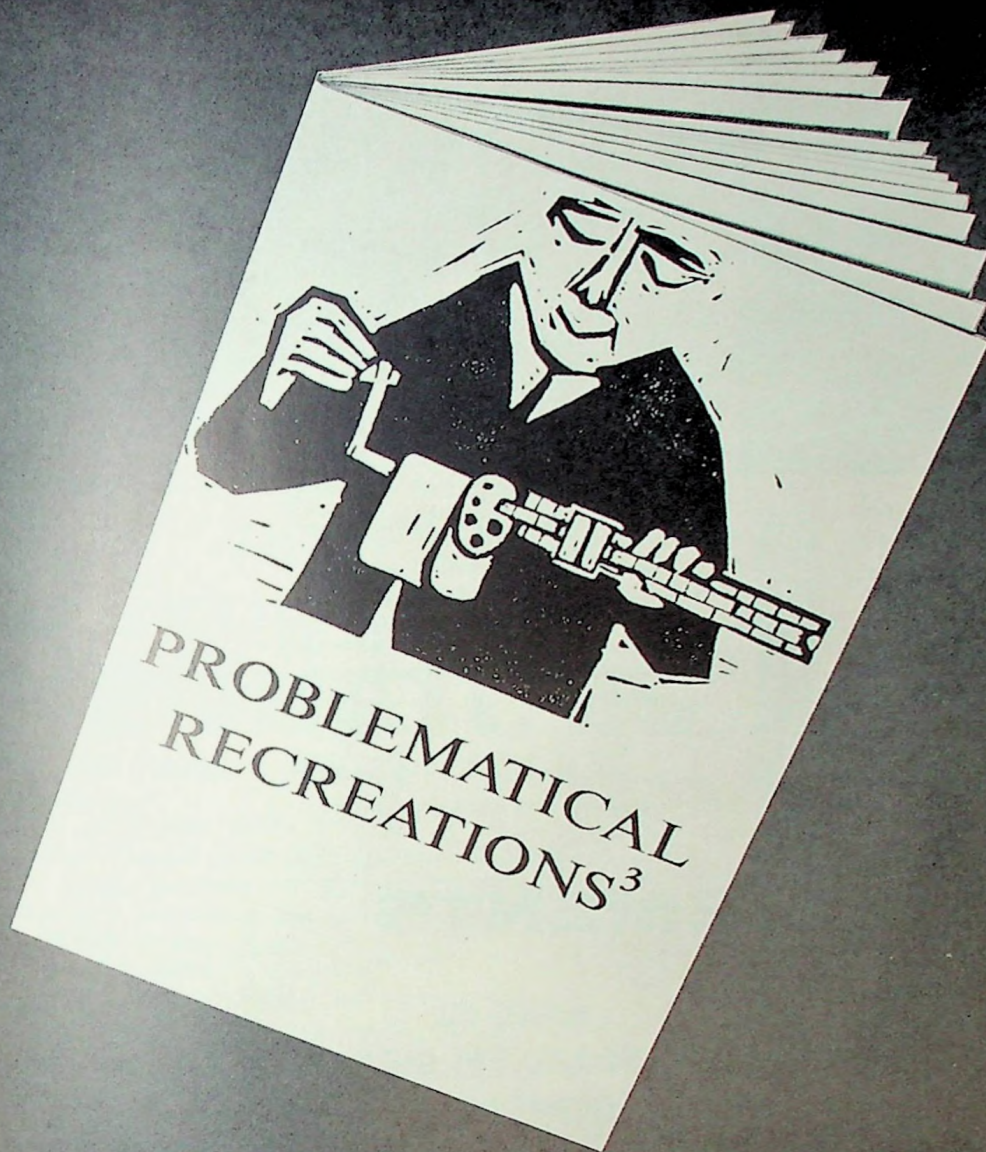
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James L. Halcomb, Varian, speaker, and Walter Prise, chairman of the PGMIL Chapter, join in coffee after the recent meeting

meeting review

PERT FOR THE ENGINEER

The first meeting of the year for the Professional Group on Military Electronics was held at Lockheed's Palo Alto auditorium, preceded by a speaker's dinner. The speaker for the evening was James L. Halcomb, manager of military

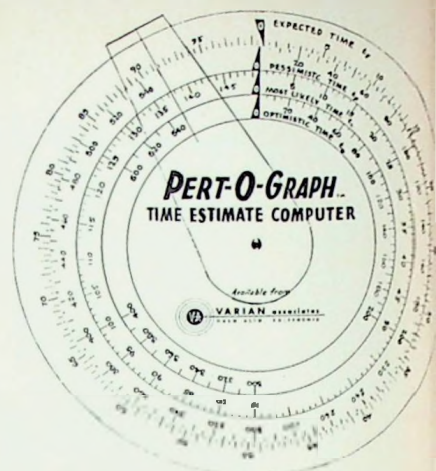
magnetics application at Varian Associates, and the subject was, "Applying the Pert Management System to Small Programs."

Pert applied to massive programs such as the Polaris missile have been highly successful. Halcomb illustrated how Varian has applied the principles of Pert to small programs and with a high degree of success. The purpose of Halcomb's talk was to bring Pert down to the level of individual small engineering jobs, whether they be the delivery of a complete electronic system, a black box for the system, or even the research program necessary for a new system or equipment.

Halcomb also emphasized that Pert can be used by the individual engineer to schedule his work. Pert can be applied as a managerial tool on all levels of a project.

The use of an interesting circular slide rule, the Pert-O-Graph Time-Estimate Computer, developed by Varian Associates, was described (see illustration). The "computer" is an aid in determining the expected time schedule based upon the pessimistic, most likely, and optimistic times. This novel aid should prove to be a very useful tool and will be available shortly through Varian Associates.

All concerned undoubtedly went away



Newly developed small-program Pert computer

from Halcomb's talk ready to "pert" almost any kind of job, from an electronic package design to adding a new room on a home—a very worthwhile and interesting talk.

—JOE WETTSTEIN

the wordsmiths

HOW TO DO IT

A course on writing and illustrating for technical publications is being offered by the University of California Extension Service. Hyman Olken, of the Lawrence Radiation Laboratory, is the instructor. The course will feature practical writing assignments as well as instruction in the principles of writing and illustrating. The series of 15 two-hour classes will be held in Room 219, Bldg. 143, Lawrence Radiation Laboratory, Livermore, beginning March 12, 4:45 to 6:45 P.M. Cost of the course (=863AB) is \$30. Further information may be obtained from the Extension Service, University of California, Berkeley 4, California; THornwall 5-6000, Ext. 2221.

wescon news

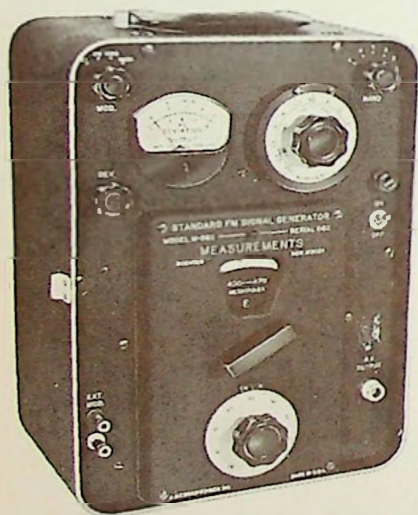
THE INELASTIC FRONTIER

First word of exhibit space availability for the 1962 Wescon recently went to prospective exhibitors in the form of a colorful 12-page brochure.

Floor plans for the 1,240-booth trade show are shown in the brochure, along with instructions for making application for exhibit space.

(Continued on page 22)

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MORE MILLIMETER devices in this part of the spectrum, fabrication would be difficult, but the design does lend itself to hobbing techniques similar to those currently used at Raytheon.

—R. J. PRICKETT



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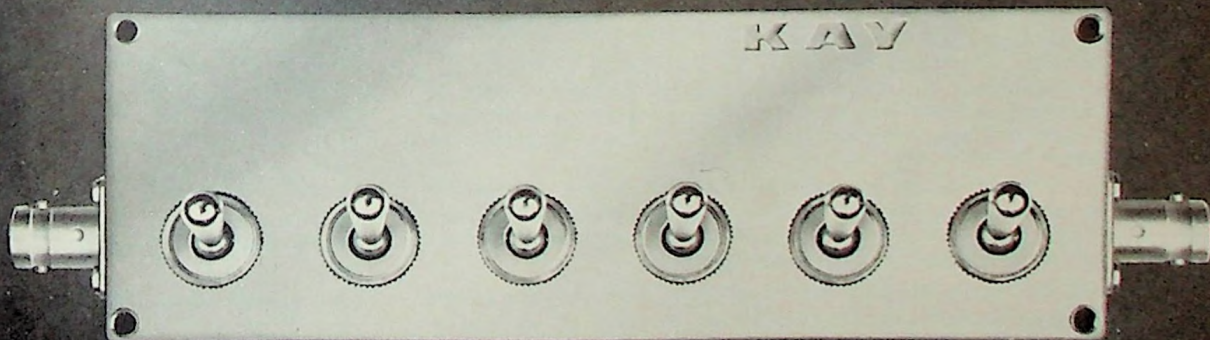
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MORE WESCON

This year Wescon will be staged in the Los Angeles Memorial Sports Arena, August 21-24. The Tuesday-through-Friday dates, long followed by Wescon, were challenged at last year's exhibitor meeting. (Some exhibitors felt a Monday-through-Thursday schedule would better serve the industry and reduce labor overtime during the set-up period. Apparently the majority of exhibitors did not share in the opinion, for the vote in favor of the usual Tuesday-through Friday dates won out on a general exhibitor survey.)

The 1962 Wescon brochure is built around the theme which has been adopted by the current year's committee. "Frontiers in Electronics" is the phrase on which Wescon 1962 will hang its promotion. Every activity of the huge event will emphasize this theme.

background data

COMPUTER TECHNOLOGY

Two new reports recently made available by the office of technical services of the business and defense services administration, U. S. Department of Commerce, can be ordered from the San Francisco field office.

Electronic Digital Computing Systems, is an 1100-page catalog of digital computers, one of the most comprehensive yet compiled. Both engineering and programming characteristics of the 222 electronic digital computing systems either in operation or commercially available in the United States are described. Large, intermediate, and small "complete" scale systems are covered.

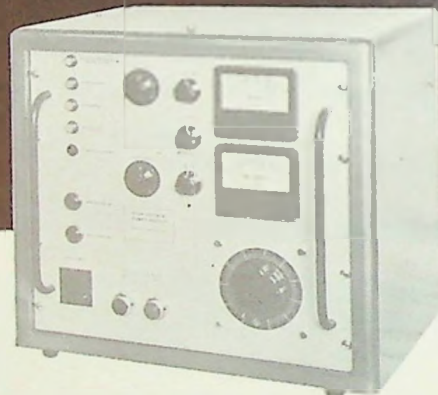
Information for each computing systems covers: applications; programming and numerical system; arithmetic unit; storage; input; output; circuit elements of entire system; checking features; power, space, weight, and site preparation; production record; cost, price, and rental rates; personnel requirements; reliability, operating experience and time availability; additional features and remarks; future plans; installations, photographs of each system wherever possible. PB 171 625 \$10.

A keyword classifying system is covered in a 32-page report. A data processing system that classifies research and technical reports through certain keywords in the titles of the publications has been adopted by the Lawrence Radiation Laboratory at the University of California. Certain keywords, together with surrounding words that act as modifiers, are selected from the titles of technical publications. These keywords, with their modifiers, serve as index entries. UCRL-6510-75 cents.

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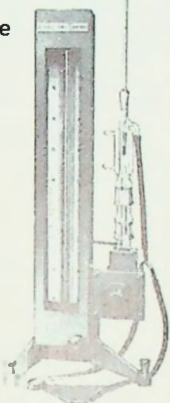
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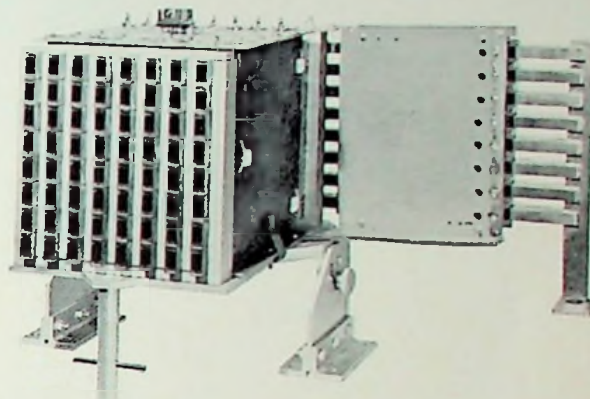
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■ Requirements of new and continuing projects concerned with space vehicle communications, navigation, and radar have created new openings for electromagnetic theory specialists as well as antenna engineers. The scientists and engineers of the Research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

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Head table at the February annual Bosses Night of the Women's Association of the Electronic Industry included Robert Lawhead, IBM research laboratory; Mary Fraser, president of WAEI; Bill Melchior and Marie Cieslak of Eichorn & Melchior; and A. E. Schwartz and Norma Duffield of Dalmo Victor

summer touring

HOW TO GET ACROSS

A tax-deductible tour of England, Holland, Germany, Switzerland, Italy, and France for engineers and scientists will be sponsored by Arizona Engineer and Scientist magazine next summer.

Tentative plans are to visit engineering and/or scientific activities in London, Amsterdam, Dusseldorf, Cologne, Frankfurt, Heidelberg, Stuttgart, Zurich, Milan, Geneva, and Paris during the week and to join the ladies in their sight-

seeing on the weekends and in the evenings.

The final itinerary has been prepared and brochures are available. For a copy, you should write Arizona Engineer and Scientist at P.O. Box 1626, Scottsdale, Arizona.

The first section of the tour has now been limited to 45 participants. Every effort will be made to satisfy everyone within broad lines of interest: electronics, power, manufacturing, building, and research.

The tour will be designed so that the individual engineer or scientist can de-

duct most or all of the cost which has been set at \$1,488 for first-class accommodations. This tariff covers all expenses except a few meals in London and Paris where only breakfast is served.

The group will leave Phoenix by jet on July 27 and return on August 19. Arizona Engineer and Scientist is the official publication of the Arizona Council of Engineering and Scientific Associations, a group made up of 19 professional and technical societies including three sections of IRE and two sections of AIEE.

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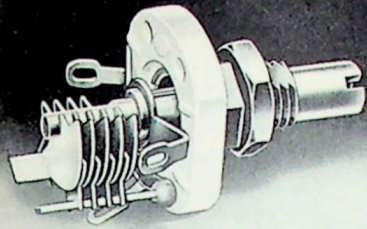
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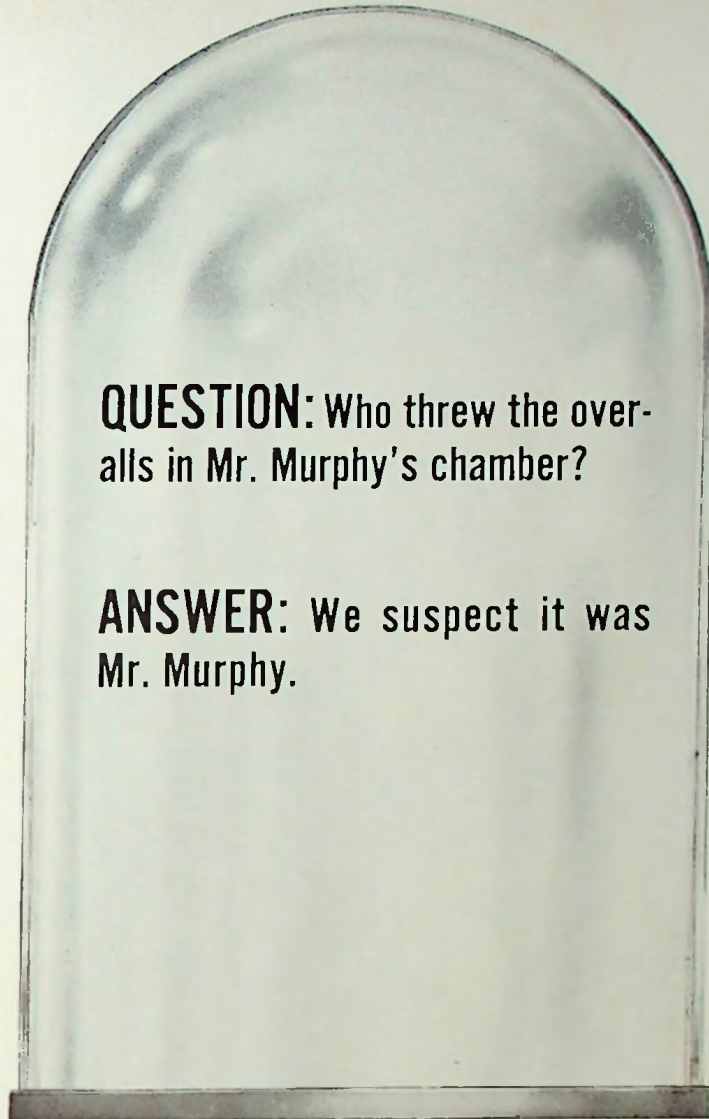
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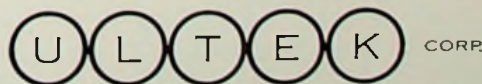
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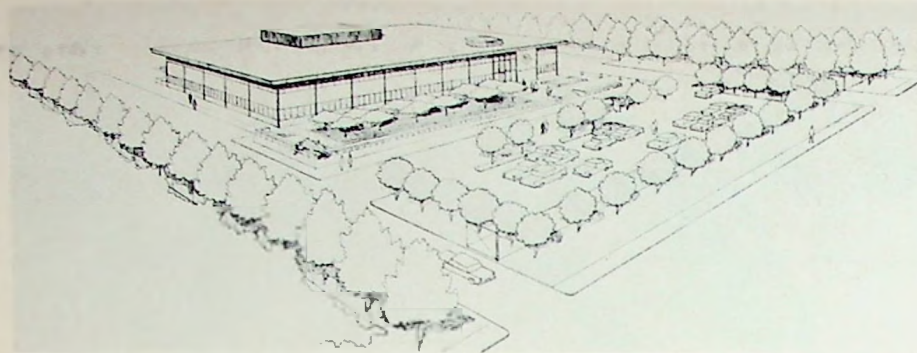


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IT IS REPORTED:

Konrad Schoebel, founder and president of **Precision Instrument Company**, used the traditional gold shovel in ground-breaking ceremonies for the company's new million-dollar building in Stanford Industrial Park. In addition, however, a recording, made of his heart action, utilizing one of the firm's recorders, indicated the effect of his exertions to be within a safe tolerance for the average healthy business leader.

Wurster, Bernardi and Emmons of San Francisco are the architects for the 62,000-sq-ft structure. Occupancy is expected by November of this year.

The San Francisco council of the **Western Electronic Manufacturers Association** (WEMA) will be guided in 1962 by Chairman **Walter G. Scott** of IBM.

Emmet G. Cameron, Varian, is incoming vice chairman, and **William H. Heflin**, Fisher Research, is secretary-treasurer. New directors: **Kenneth T. Larkin**, Lockheed; **John W. Scheck**, Beckman; and **Thomas H. Morrin**, Stanford Research Institute.

Jerry D. Franks has become personnel manager of **Granger Associates**, filling a new position created to centralize personnel services.

A management development program of **WEMA** (Western Electronic Manufacturers Association) gets under way with the appointment of a full-time staff pro-



Schroeder

Beeson

fessional to direct the program. **Albert C. Beeson** has joined the WEMA staff and will be headquartered in the Palo Alto office.

Beeson, well known in the electronic industry, already has begun preliminary planning for the first WEMA workshop seminars to be held this spring. A business faculty member at Santa Clara University for the past seven years, he will continue teaching there part-time. He also has taught at Rutgers and at Stanford, where he received his AB degree. He has an MBA from New York University.

Beeson's business experience includes seven years as director of industrial relations for Food Machinery Corp., San Jose, and a similar assignment with National Union Radio seven years. Previously, he was an economist for U. S. Rubber Co.

Beeson was appointed by President Eisenhower to the National Labor Relations Board in 1954. The following year, he declined reappointment to return to California where he was manager of Valley Fair shopping center in San Jose.

Henry W. Schroeder has been appointed to the position of commercial products marketing manager at **Melabs**. Schroeder was with Sylvania Electric Products Inc., Mountain View, for nine years, most recently as product specialist in their microwave device division. Prior to this, he was employed by North American Aviation Inc.

He is presently chairman of the arrangements committee of the Section.

John W. Dymecki has been appointed sales representative for the computer division of **Philco**.

Beckman & Whitley Inc., San Carlos, has named **James M. Kelly** research scientist. In this new position Kelly will be concerned with research and de-

(Continued on page 28)

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BEFORE



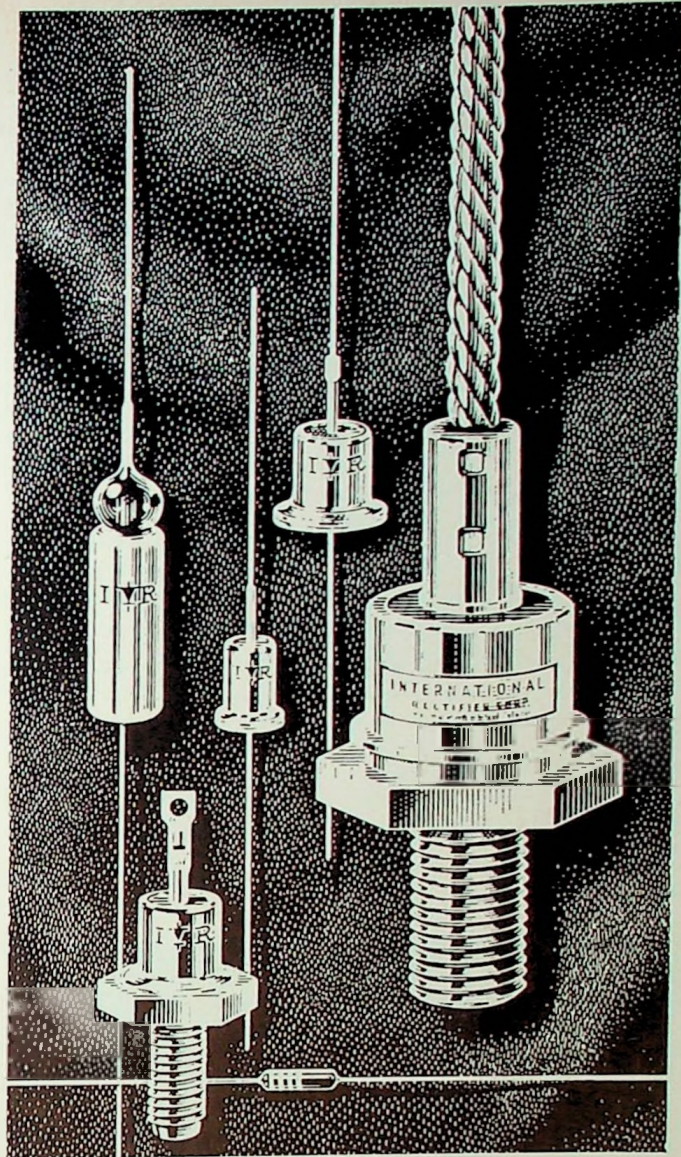
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velopment problems primarily in the areas of dynamic stress analysis, stress wave propagation, and vibration. Kelly reaches Beckman & Whitley from Stanford University where he has been completing work on his PhD in structural mechanics.

Paradynamics Inc., Westbury, New York, has announced the acquisition of **Wave Particle**, a division of Ramage & Miller Inc. of Richmond.

Donald G. Barker has joined the **V. T. Rupp Co.**, manufacturers' representatives, as field engineer. Barker will work out of the firm's Northern California office. Before this assignment, Barker served as a sales staff engineer with Neely Enterprises, in San Carlos.

Dale B. Stevens and **Roger A. Frech** have recently joined the staff of the

A. B. Dick Company research and development laboratory in Palo Alto. Both men were formerly with General Dynamics/Electronics in San Diego.

In their new positions, Stevens will be regional sales manager for Videograph and Frech will be a research engineer responsible for design and development of high-speed printout and display devices.

United Research Inc., with headquarters in Cambridge, Mass., has announced a reorganization of research services. As a result of the change, URI's West Coast subsidiary, **Broadview Research Corp.** has undergone a change in name to **United Research Services Incorporated**.

James C. Rich has been appointed to the newly created position of plant engineer for **Precision Instrument Company**.

Fairchild Semiconductor has announced the appointment of **Herbert N. Leifer** as manager of the new basic physics section of the Palo Alto research and development laboratory. Leifer was formerly with Lockheed Missile and Space Company in Palo Alto.

The **APM-Hexseal Corporation**, Englewood, N. J., has appointed **Joseph**



Solins

Lien

Solins as its western regional sales manager. In his new assignment, Solins will be a factory field representative with offices in San Jose.

Jesse R. Lien has been appointed vice president and general manager of the **Sylvania Electric Products** western operation in Mountain View.

Lien was named general manager in February, 1961, of the western operation, which includes the company's electronic defense laboratories and reconnaissance systems laboratory in Mountain View and its systems plant in Santa Cruz.

Cerruti-Pfiegler Corp. of Palo Alto has been named representative for **Raytheon Company's** commercial apparatus & systems division.

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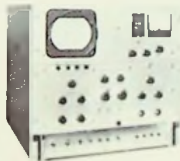
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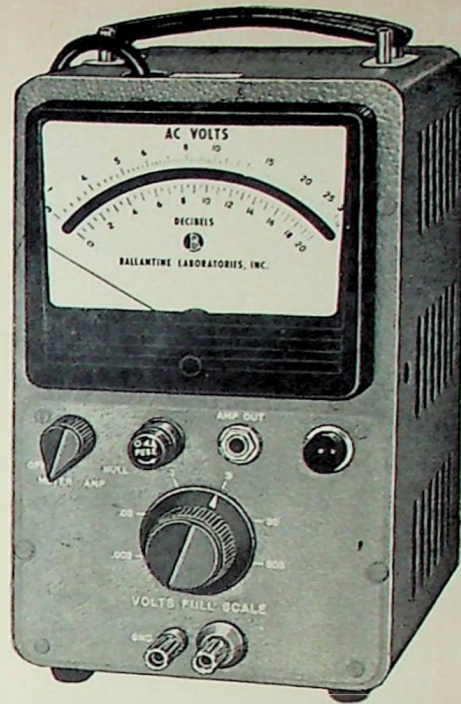
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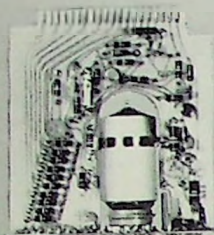
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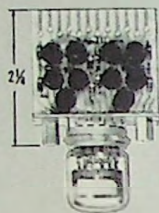
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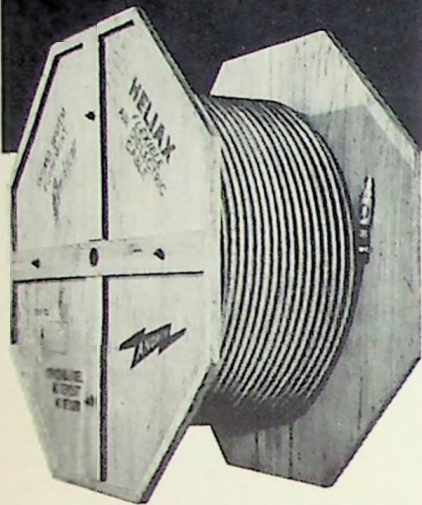
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7/8"	HT5-100	RG285/U	RE49C775
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1 1/8"	H7-75	RG286/U	RE49C776
1 1/8"	H7-100	RG287/U	RE49C777
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events of interest

IRE MEETINGS SUMMARY

Mar. 26-29—**IRE International Convention.** Coliseum and Waldorf Astoria Hotel, New York, N.Y. Exhibits: W. C. Copp, IRE Adv. Dept., 72 W. 45 St., New York 36, N.Y. Program: Dr. D. B. Sinclair, chairman 1962 technical program committee, 1 East 79 St., New York 21, N.Y. Convention records: order from IRE Headquarters.

Mar. 28-29—**3rd Symposium on Engineering Aspects of Magnetohydrodynamics.** University of Rochester, New York. No exhibits. Program: George W. Sutton, MIT Room 3-254, Cambridge 39, Mass.

April 11-13—**Southwest IRE Conference and Electronics Show (SWIRECO).** Rice Hotel, Houston, Texas. Exhibits: J. C. Robinson, PO Box 1505, Houston, Texas. Program: Prof. Martin Graham, Rice University, Houston 1, Texas.

April 24-26—**Symposium on Mathematical Theory of Automata.** Engineering Society Building auditorium, UN Plaza, New York, N. Y. No exhibits. Program: symposium committee, Polytechnic Institute of Brooklyn, 55 Johnson St., Brooklyn 1, N. Y. Proceedings: Microwave Research Inst., 55 Johnson St., Brooklyn 1, N. Y.

May 1-3—**Spring Joint Computer Conference.** Fairmont Hotel, San Francisco. Exhibits: John Ball, Pacific Telephone Co., 3240 Arden Way, Sacramento. Program: Richard I. Tanaka, Lockheed, Dept. 58-51, Palo Alto.

May 24-26—**Seventh Region Conference.** Olympic Hotel, Seattle, Washington. Exhibits: Century 21 Fairgrounds. Program: T. G. Dalby, 3220 99th N.E., Bellevue, Washington.

NON-IRE LOCAL EVENTS

March 19—**Women's Association of the Electronic Industry.** Old Plantation Restaurant, 1030 N. San Antonio Road, Los Altos. Dinner: 7:00 p-m (social hour, 6:30 p-m). Speaker: William T. Kirk, director of technical information for Stanford Linear Accelerator Center, who will give a talk illustrated with slides. All interested women in electronic firms are welcome. Reservations: Margaret Paul, Hewlett-Packard, DA 6-7000.

Mar. 27—**American Society for Quality Control, San Francisco Bay Area Section, and Stanford University, Maintainability Seminar.** 9 a.m., Stanford University. Registration (\$10 includes luncheon and transactions): Jack D. Crowley, 641 San Miguel Ave., Sunnyvale.

March 28—**The Electromechanical Society, San Francisco Section.** Masers, by Stephan Gorog. Men's Faculty Club, Berkeley. Dinner: 6:45 p-m. Technical session: 8 p-m. Reservations: H. F. Bauman, RE 9-4321, ext. 26636.

March 31—**Women's Association of the Electronic Industry (WAEI).** Luncheon and Fashion Show—Scholarship Fund Benefit. Theme: Transistors. Stage Coach

Room, Pioneer Hotel, Woodside. Tickets: Cynthia Heuser, Varian Associates, DA 6-4000, ext. 2260.

April 25-29—**Western Space Age Industries and Engineering Exposition/Conference.** Cow Palace, San Francisco.

Governor Edmund G. Brown is host for the event staged by the governors of the 13 western states, 169 chambers of commerce, 71 industrialists, and various federal procurement agencies. Members of the exposition's board of industrial advisors include: E. Finley Carter, SRI; Gavin I. Cullen, IBM; William W. Eitel, Eitel-McCullough; D. W. Gunn, Sylvania; Walter S. Johnson, Friden Inc.; C. O. Lindeman, Pacific Telephone Co.; Walter A. Maytham, Litton Industries; David Packard, Hewlett-Packard; H. Myrl Stearns, Varian Associates; N. R. Sutherland, Pacific Gas & Electric Co.; C. C. Walker, General Electric Co.

May 27-June 2—**University of California Extension, fifth annual leadership laboratory in human relations and supervisory skills.** Ojai Valley Inn, Ojai. Information: University of California Engineering and Physical Sciences Extension, UCLA, Los Angeles 24.

PAPERS CALL

April 15—100- to 200-word abstracts, 500- to 1000-word summaries, and indication of technical field of the paper, along with title of paper and name and

address of author for Wescon (Los Angeles; Aug. 21-24). Send to: Wescon business office, 1435 La Cienega Blvd., Los Angeles 35, Calif.

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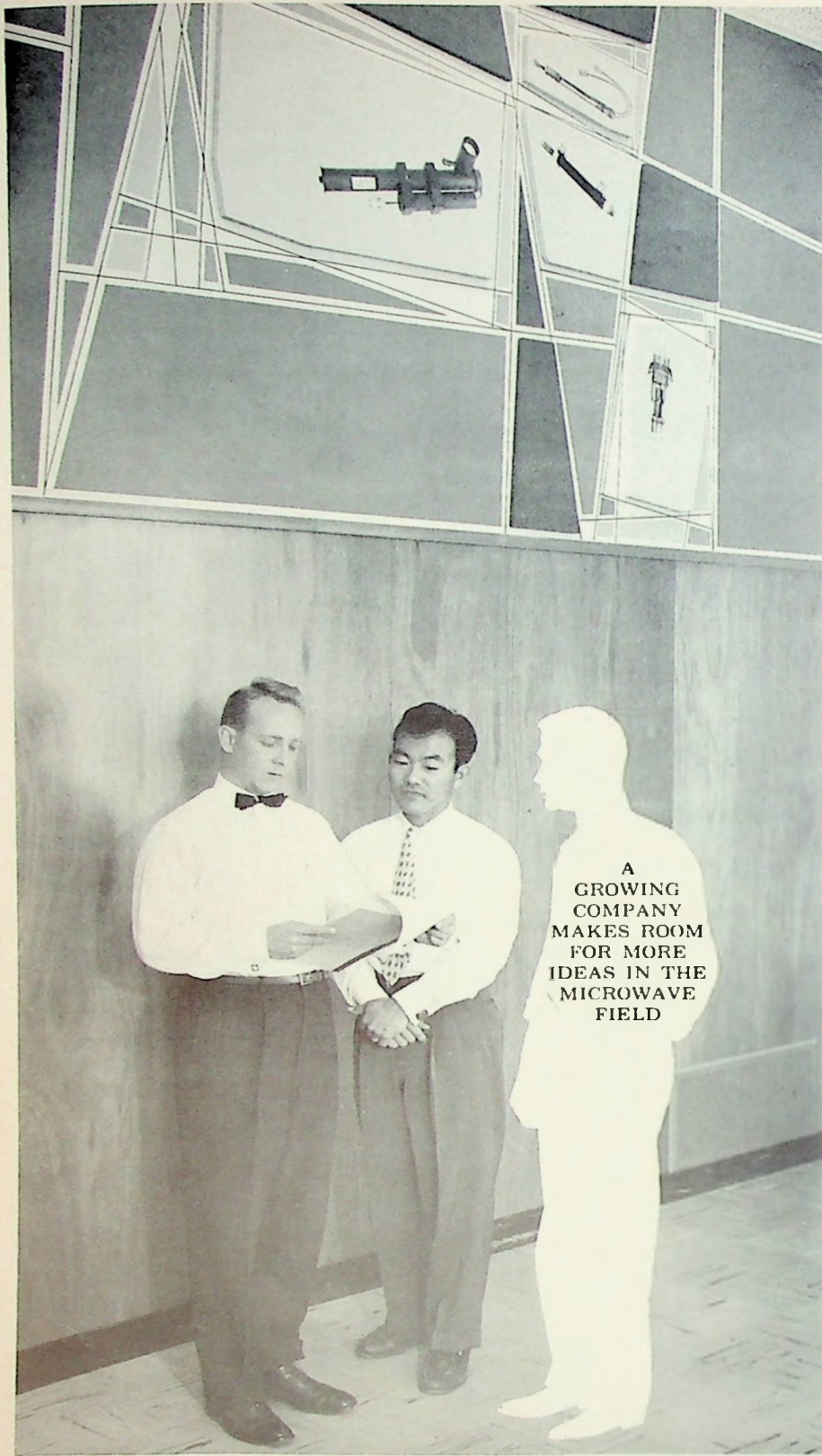


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D. B. Barnes	R. A. Magnenat
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Harry L. Hill	C. E. Wilkerson
Joel C. Hosoa	G. H. Wilson
D. W. Hunnicutt	Robert H. Wyman, Jr.
D. L. Johnston	H. Yashida

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

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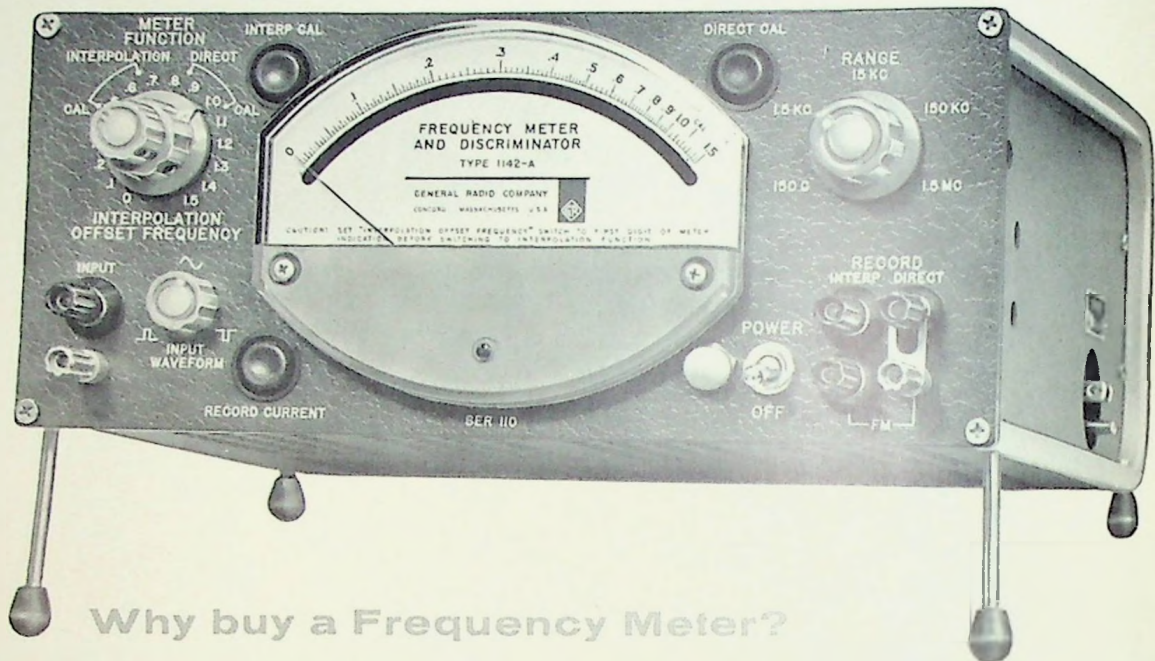
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