EDITOR'S PROFILE of this issue

from a historical perspective …

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

January, 1965:

Cover: An aerial photo of the Stanford Linear Accelerator, now about half-finished; at 2 miles long, it will be the most powerful atom-smasher in the world. I used to ride my bike out along Sand Hill Road in the springtime to study on a hill overlooking the construction site. More details on page 12.

Page 13: We get a look at the Boeing 733, the company's planned Supersonic Transport (SST)

Archive of available SF Bay Area GRID Magazines is at this location:
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IEEE
January 1965
SAN FRANCISCO SECTION
INSTITUTE OF ELECTRICAL
AND
ELECTRONICS ENGINEERS

meeting reminder

January 12 (Tuesday) Industry and General Application

January 14 (Thursday) Information Theory

January 18 (Monday) Biomedical Engineering, Engineering Management/Engineering Writing and Speech

January 19 (Tuesday) Antennas and Propagation

January 20 (Wednesday) Military Electronics

January 20 (Wednesday) Santa Clara Valley Subsection

January 21 (Thursday) Microwave Theory and Techniques, Nuclear Science

January 25 (Monday) East Bay Subsection

January 26 (Tuesday) Automatic Control, Computer, Product Engineering and Production, Space Electronics and Telemetry

January 27 (Wednesday) Communication Technology, Electron Devices

January 28 (Thursday) Audio

February 4 (Thursday)

February 16 (Tuesday) Engineering

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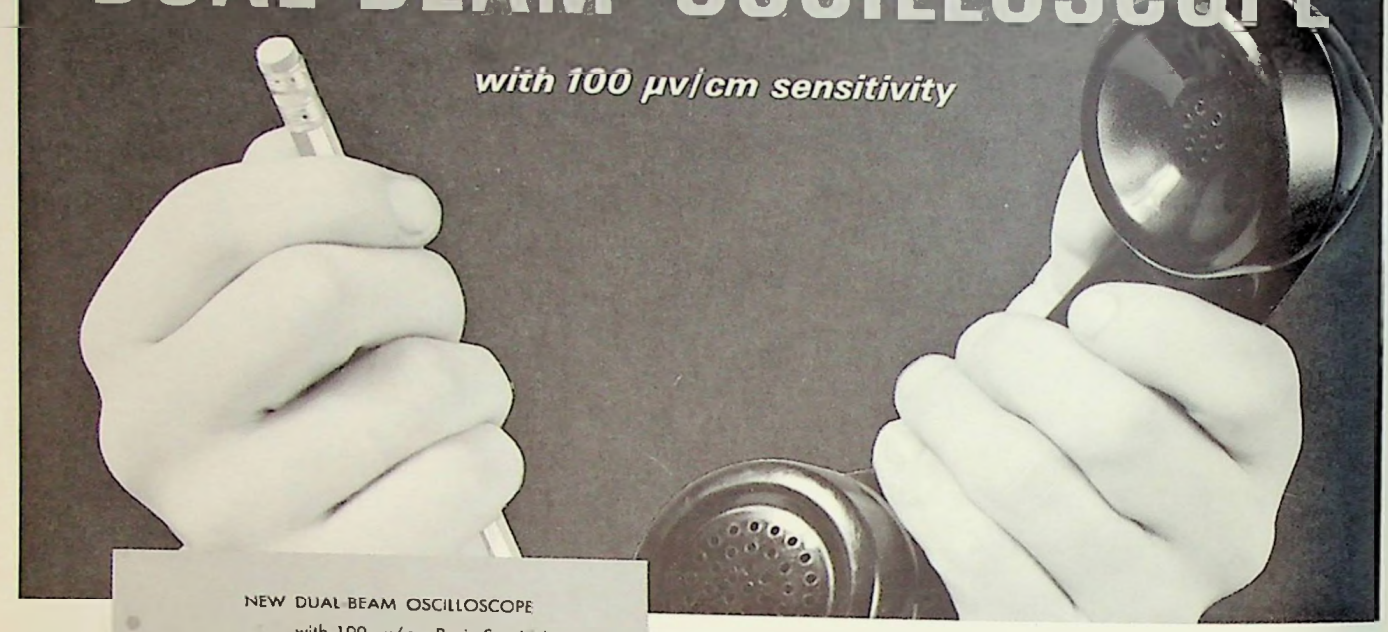

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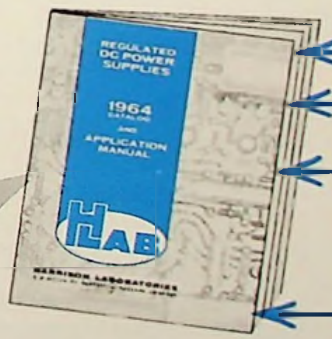

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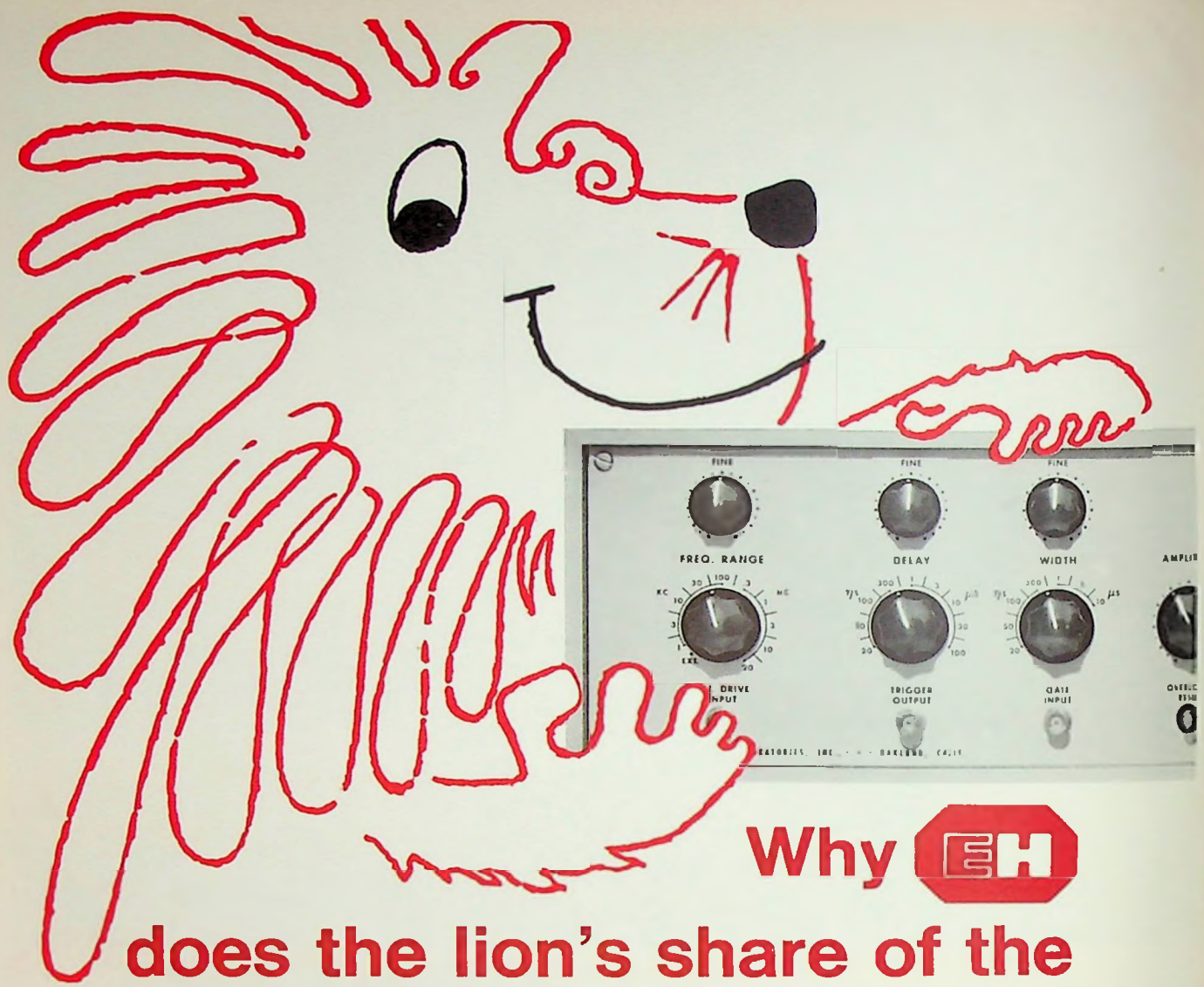

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IEEE Grid
volume 11
number 5
january, 1965

Published monthly except July and August by San Francisco Section, Institute of Electrical and Electronics Engineers

address all mail to
IEEE, Suite 2210, 701 Welch Road
Palo Alto, California 94304
Telephone: (415) 327-6622

Members: send address change promptly to IEEE, Box A, Lenox Hill Station, New York, N.Y. Send copy of letter to Section Office

executive editor:
JAMES D. WARNOCK

advertising director:
ERNESTO A. MONTANO

editorial & advertising assistant:
MRS. JEAN HELMKE

subscriptions:
$4.00 (members); $6.00 (others); overseas, $7.00 per annum

contents

Mailing office of publication: 363 Sixth Street, San Francisco 94103
Second class postage paid at San Francisco

san francisco section officers

advertising

Bay Area & National: E. A. Montano, IEEE, 701 Welch Rd., Palo Alto, Calif. (415) 327-6622
East Coast: Cal Hart, Martin & Hart, 25 W. 43rd St., New York, N.Y., LW 4-1290
Southern California: Jack M. Rider & Associates, 1709 W. 8th St., Los Angeles 17, HU 3-0537

educational notes

CAL EXTENSION

University of California Extension evening courses in electrical engineering and related fields begin during February in Palo Alto, Berkeley, San Francisco, Redwood City, and Atherton.

Included in the Palo Alto course schedule are "Magnetic Memory and Logic Circuits" and "Systems Design and Development," starting Feb. 2; "Introduction to Magnetic Recording Techniques," "Basic Transistor Analysis and Circuitry," "High Temperature Materials," and "Introduction to Microwave Technology," beginning Feb. 3. Courses starting later in the month are "Statistical Mechanics," Feb. 9, and "Switching Theory and Logical Design," Feb. 16. All courses meet at Wilbur Junior High School.

Scheduled on the University campus at Berkeley are "Programming a Business Computer" and "Technical Writing and Engineering Reports," both starting Feb. 3. Courses at the U.C. Extension Center in San Francisco include "Industrial and Computer Electronics," Feb. 3, and "Chemistry of Surface Coating Materials," Feb. 9.

Additional Peninsula courses are "Infrared Systems," starting Feb. 1 at Menlo-Atherton High School; "Antenna Systems Engineering," "Transients in Linear Systems," and "Administration of the Engineering Function," scheduled to begin Feb. 1 and 2 at Sequoia High School, Redwood City.

Course descriptions, scheduling details, and enrollment information are available from Engineering Extension, University of California, Berkeley 4, telephone 845-6000, Ext. 4151, or from the San Francisco Extension Center, 55 Laguna St., telephone UN 1-6833.

cover

The two-mile linear accelerator being built by Stanford University under contract with the AEC is now approximately half completed, the 20 BeV atom-smasher occupying 480 acres of campus land. At upper right is Half Moon Bay, at upper left—Searsville Lake. Sand Hill Road extends from upper left to Menlo Park at lower right. The largest scientific instrument yet built, the accelerator will permit scientists to probe deeper than ever before into the structure of the atom. For more on SLAC, see page 12.

(Photo by Roland Quintero)

Hart *Scott*

meeting ahead

OVERSEAS TIES

S. V. Hart, chief consultant, Electronics Engineers International, San Francisco, will discuss management ties with overseas electronics—one approach to corporate diversification—at the January 18 meeting of the Engineering Management chapter.

The current reorientation of electronics firms in the Bay Area has posed the question: "How can we diversify into commercial-industrial products and markets quickly; how can we become less dependent on government contracts and enter the higher-profitability markets of peacetime consumption?"

Certainly, one approach is foreign markets. However, it is rather late to attempt to "break into" overseas markets by the conventional route; i.e., by export agents and sales representatives. Establishing a company-owned subsidiary is time-consuming and costly. Is there a better way?

The talk will describe a solution which has been proven in practice. It amounts to: trading know-how for participation in an overseas company.

This approach has many of the advantages of a company-owned foreign operation without the disadvantages of delays, expenses, and the (often painful) adjustment to an unfamiliar cultural and technological climate.

(Continued on page 8)

meeting ahead

RECORDER PRODUCTION

Manufacturing engineering's role in the development and production of commercial and military tape recorders will be discussed by Walter Scott, manager of manufacturing engineering, Precision Instruments, Palo Alto, at the January 26 meeting of the Product Engineering and Production chapter.

A graduate of the University of California in industrial engineering, Mr. Scott has had experience with Friden, Rheem, and Ampex, where he was a manufacturing engineer and then moved into design engineering, handling packaging on systems such as Dynasoar and Silver King.

MEETING CALENDAR

EAST BAY SUBSECTION

7:30 P.M. • Monday, January 25

The Stanford Linear Accelerator—significance to the nuclear field
Douglas William Dupen, technical information officer, SLAC, Stanford
Place: PG&E meeting room, 4801 Oakport, Oakland (off Nimitz Freeway)
Dinner: none

SANTA CLARA VALLEY SUBSECTION

8:00 P.M. • Wednesday, January 20

Underground distribution schemes for residential areas
Barney Peter, Dept. of Electric Distribution, PG&E, San Francisco
Place: PH 101, Stanford
No-host dinner: 6:30 P.M. at Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto, for those who wish to meet the speaker
No reservations required

GROUP CHAPTERS

Antennas and Propagation

8:00 P.M. • Tuesday, January 19

Anti-fading techniques for large antennas
Prof. Edgar C. Hayden, University of Illinois
Place: PH 100, Stanford University
Dinner: 6:45 P.M., Rudolfo's, 4020 El Camino Real, Palo Alto
Reservations: TH 5-6000, Ext. 3539, by January 15

Audio

8:30 P.M. • Thursday, January 28

The manufacture of precision magnetic tape
Donald S. Eldridge, vice president and technical director, Memorex Corp.
Place: SRI conference room B, 333 Ravenswood Ave., Menlo Park
Cocktails: 6:15 P.M.
Dinner: 6:45 P.M. at Ramor Oaks, El Camino Real, Atherton
Reservations: 248-3344, Ext. 260

Automatic Control

8:15 P.M. • Tuesday, January 26

(Joint with Space Electronics and Telemetry—see below)

Automatic Control

8:00 P.M. • Tuesday, February 16

(Joint with Biomedical Engineering—see below)

Biomedical Engineering

8:00 P.M. • Monday, January 18

(Joint with Instrument Society of America [ISA]—Santa Clara Valley Section)
Blood pressure instruments—what do they really measure?
Dr. Alvin Sacks, head, hemodynamics section, Vidya Corp.
Place: Holiday Inn, Bayshore Freeway at Lawrence Station Rd., Sunnyvale
Dinner: 7:00 P.M. (Social hour at 6:30) at the Holiday Inn
Reservations: Dr. James Bliss, SRI, 326-6200, Ext. 3488, by January 15

Biomedical Engineering

8:00 P.M. • Tuesday, February 16

A new class of pulse-frequency modulated feedback systems and its application to neural nets
Prof. E. I. Jury, University of California
Place: Stanford Medical School, Room 112
Dinner: 6:15 P.M., Red Cottage, Menlo Park
Reservations: Dr. James Bliss, 326-6200, Ext. 3488, by February 15

MEETING CALENDAR

Communication Technology

7:30 P.M. • Wednesday, January 27

The increasing importance of communications for improved utility operations
W. I. Emmons, supervising communications engineer, and
D. G. Gregory, communications engineer, both of Pacific Gas & Electric Co.
Place: Auditorium, ground floor, PG&E Building, 245 Market St., San Francisco
No host cocktails at 5:30 P.M.
Dinner: 6:00 P.M., The Iron Duke, 132 Bush St., San Francisco, $4.00
Reservations: F. S. Beale, 591-8461, Ext. 292, by 4:30 P.M. of January 26

Computer

8:00 P.M. • Tuesday, January 26

Content addressed memories
Dr. Harold Petersen, IBM, San Jose
Place: GE Computer Laboratory, 310 DeGuigne Drive, Sunnyvale
Dinner: 6:15 P.M., Old Plantation, El Camino and Bernardo, Sunnyvale
Reservations: none required

Electron Devices

8:00 P.M. • Wednesday, January 27

The Gunn effect—microwave oscillations in gallium arsenide
Dr. Herbert Kroemer, Varian Associates, Palo Alto
Place: PH 101, Stanford University
Dinner: 6:00 P.M., Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto
Reservations: Mrs. Williams, 854-3300, Ext. 557, by January 26

Engineering Management

8:00 P.M. • Monday, January 18

(Joint with Engineering Writing and Speech, see below)
Management ties with overseas electronics—one approach to corporate diversification
S. V. Hart, chief consultant, Electronics Engineers International, San Francisco
Place: Granger Associates, 1601 California Ave., Palo Alto
Dinner: 6:15 P.M., Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto
Reservations: 326-6200, Ext., 2550, by January 15

Engineering Writing and Speech

8:00 P.M. • Monday, January 18

(Joint with Engineering Management, see above)

Engineering Writing and Speech

8:00 P.M. • Wednesday, February 24

A proposal philosophy—some new angles in marketing development
Frank Mansur, Lockheed Missiles & Space Co., Sunnyvale
Place: To be announced in the February **Grid**
Dinner: To be announced in the February **Grid**

Industry and General Application

8:00 P.M. • Tuesday, January 12

Panel presentation on the San Francisco Bay Area Rapid Transit development program
Criteria for selection of electrical systems and equipment by *J. R. Asmus;* train control systems by *W. P. Quintin, Jr.;* propulsion systems by *K. L. Lawson;* and power distribution systems by *C. K. Olsen*
Place: Marconi Restaurant, 122 Battery St., San Francisco
Cocktail hour: 6:30 P.M.
Dinner: 7:00 P.M.
Reservations (before January 10): Alex Tseng, SLAC: 854-3300, Ext. 534, or Dan McDade, 230 Ryan Way, South San Francisco, 761-1360
Transportation: Arrangements have been made to have cars available for home returning to East Bay, Marin County, and Peninsula areas

(Continued on page 6)

meeting ahead

BART PROGRAM

A four-member panel will discuss the San Francisco Bay Area Rapid Transit development program at the January 12 meeting of the newly formed Industry and General Applications chapter.

The panelists, all electrical engineers with the joint venture engineering firm responsible for the detail design and management of construction of the system, Parsons, Brinckerhoff-Tudor-Bechtel, are J. R. Asmus, W. P. Quintin, Jr., K. L. Lawson, and C. K. Olsen. Their respective subjects will be criteria for selection of electrical systems and equipment; train control systems; propulsion systems; and power distribution systems.

Mr. Asmus, a graduate of the University of Texas, is chief electrical engineer of the firm. He was formerly senior engineer in the power and industrial division of Bechtel Corp. responsible for the engineering of various utility projects, and was formerly employed by International Engineering Co. and Pacific Gas & Electric. Mr. Quintin, a graduate of Ohio State University and a senior electrical engineer responsible for the automatic train control and communications systems, worked on another rapid transit project and other assignments with Bechtel, and was formerly associated with the Union Switch & Signal Division of Westinghouse Air Brake Co. Mr. Lawson, a graduate of Northwestern University and a senior electrical engineer responsible for coordinating the power, control, and auxiliary apparatus on the transit vehicle, worked on several industrial projects with Bechtel and was formerly employed by Westinghouse Electric Corp. and Aluminum Co. of America. Mr. Olsen, a graduate of the University of Utah and a senior electrical engineer responsible for the wayside electrical power equipment, was assigned to pipeline, power, and industrial projects at Bechtel, and was formerly vice president of a consulting firm in Utah.

meeting ahead

VALUE ENGINEERING

The emphasis the Department of Defense is now placing on value engineering, the background of the present market and its impact on military business, and how value engineering should be applied to gain a truly competitive cost position in military and commercial contracts will be discussed by Alfred H. Petersen, LMSC, Sunnyvale, at the January 20 meeting of the Military Electronics chapter.

MEETING CALENDAR

Information Theory

8:10 P.M. • Thursday, January 14

Maximum likelihood processing for seismometer arrays
Dr. M. J. Levin, Lincoln Labs., Lexington, Mass.
Some new results on the ambiguity function
Dr. R. Price, Lincoln Labs.
Place: Philco Auditorium, 3825 Fabian Way, Palo Alto
Dinner: 6:15 P.M., Rickeys Hyatt House, 4219 El Camino Real, Palo Alto
Reservations: Mrs. D. Saltzman, 326-4350, Ext. 4101, by January 13

Microwave Theory and Techniques

8:00 P.M. • Thursday, January 21

(First of three lectures on solid-state microwave devices)
A review of modern low and ultra low noise microwave pre-amplifiers
C. Louis Cuccia, director, research and engineering, Microwave Electronics Corp.
Place: Room 1A, Hewlett-Packard Co., 1501 Page Mill Road, Palo Alto
Dinner: 6:30 P.M., Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto
Reservations: Bob Prickett, HP Co., 326-7000, Ext. 2117, by January 19
Second lecture: Thursday, February 4—time and place same as above
Third lecture: Tuesday, February 23—time and place same as above

Military Electronics

8:00 P.M. • Wednesday, January 20

Value Engineering
A. H. Petersen, Lockheed Missiles & Space Co., Palo Alto
Place: Lockheed Auditorium, Bldg. 202, 3251 Hanover St., Palo Alto
Reservations: R. W. Franks, 739-4321, Ext. 23894, by January 19

Nuclear Science

8:00 P.M. • Thursday, January 21

Business session on formation of San Francisco chapter, followed by showing of film on Civilian Application of Nuclear Explosives, 1964 (recently seen at Geneva Conference)
Place: Coral Room, Livermore Union High School, 1600 Maple St., Livermore
No dinner

Product Engineering and Production

8:00 P.M. • Tuesday, January 26

Manufacturing engineering's role in the development and production of commercial and military tape recorders
Walter Scott, manager, Mfg. Engineering, Precision Instruments, Palo Alto
Place: Precision Instruments, 3170 Porter Drive, Palo Alto (Porter Drive intersects Page Mill Road just south of the entrance to Hewlett-Packard)
Dinner: none

Space Electronics and Telemetry

8:15 P.M. • Tuesday, January 26

(Joint with Automatic Control—see above)
Gravity gradiant stabilization
Duane Scott, Research specialist, LMSC
Place: Lockheed Auditorium, Bldg. 202, 3251 Hanover St., Palo Alto
Dinner: 6:15 P.M., El Camino Bowl, 2025 El Camino Real, Mountain View
Reservations: Charles Jamgotchian, 697-7774, by January 26

meeting ahead

MEMORIES

Dr. Harold E. Petersen of the advanced systems development division of IBM's West Coast systems laboratory, Los Gatos, will address the Computer chapter on January 26. His subject will be content addressed memories.

A graduate of Stanford University and the University of Wisconsin, Dr. Petersen has been with IBM since 1957 at facilities in Los Gatos, San Jose, White Plains, Yorktown Heights, and Ossining. He has published widely on the subject of memory systems and has been associated with a number of patents, both foreign and domestic, in the area of read-only and associative memory systems, electron beam systems, character sensing, cryogenics, and error detection.

Levin *Price*

meeting ahead

INFORMATION THEORY DUO

Two speakers from the Lincoln Labs, Lexington, Mass., will address the January 14 meeting of the Information Theory chapter. Dr. M. J. Levin will discuss maximum likelihood processing for seismometer arrays. Dr. Robert Price will present some new results on the ambiguity function.

Their respective abstracts follow:

The investigation of signal processing for seismometer arrays has suggested a new mathematical model for this problem. Although it is reasonable to represent the microseismic noise as an additive multi-dimensional stationary random process, the signal cannot be convincingly modeled in the conventional fashion as either a deterministic function with unknown parameters or as a random process. Instead, the signal is assumed to be a plane wave so that it is the same in each sensor, except for a known time delay, but of otherwise unspecified form. An optimum linear processor is designed which has an undistorted response to the signal alone, while minimizing the variance of the output due to the noise. Some experimental results will be presented.

★ ★ ★

Augmenting Woodward's total-volume invariance, new information on ambiguity-function behavior is obtained and illustrated by example. The results are of two types, the first dealing with the time-frequency volume distribution and providing lower bounds to local volume, and upper bounds to attainable "clear area"; these follow from Parseval's theorem as applied to Siebert's self-transform property.

The second category of necessary conditions consists of a set of upper bounds of the norms of the ambiguity function, which places restrictions on the height distribution of the ambiguity surface. As a corollary, it is demonstrated that not all non-negative functions that are self-transformable can be ambiguity functions.

meeting ahead

LARGE ANTENNAS

Anti-fading techniques for large antennas will be the subject of Prof. Edgar C. Hayden, University of Illinois, at the January 19 meeting of the Antennas and Propagation chapter.

In HF band communication circuits, the use of a receiving antenna of high-directive gain does not of itself assure reduction of the fading range of a signal. It is possible, however, to exploit the large aperture of a directive system to produce an anti-fading action within the confines of a single array. The degree of improvement obtainable depends on the cause of the fading, the character of the incident signal field, and the aperture of the array. In practical circumstances it may range from small values up to perhaps 12 db. of reduction in the fading range. Since the improvement occurs at the low-signal end of the range, it is equivalent to an equal increase in transmitter power.

A graduate of Ohio State University and University of Illinois, Prof. Hayden has been a member of the radio-location research laboratory since 1946 and worked with the antenna research group for a year. While with the group he made studies of the efficiency of certain aircraft antenna structures and the degree of performance required of a receiving antenna system, the latter resulting in a method of determining the performance of a receiving antenna system and of integrating this performance into that of a complete receiving system. A new method was proposed for writing performance specifications for receiving antenna systems.

In the laboratory, his activities have been principally directed toward the antenna and propagation aspects of the problem. In particular, the characteristics of ionospherically propagated radio signals have been the subject of experimental study.

Hayden

Eldridge

meeting ahead

TAPE MANUFACTURE

Donald F. Eldridge, vice president and technical director of Memorex Corp., Santa Clara, will discuss the manufacture of precision magnetic tape at the January 28 meeting of the Audio chapter.

The major steps in the manufacture of magnetic tape will be discussed. Specifically described are mixing, dispersing, storage, coating, orienting, drying and curing, surface treatment, slitting, rewinding, packaging, inspection, and testing. They are covered in sufficient detail to provide the user with an appreciation of the complex processes, equipment, testing, and care which are required to produce premium quality magnetic tape.

One of the striking features of precision magnetic tape is that every single detail of each one of these steps must be done absolutely correctly. There is no possibility of going back and reworking, as in equipment manufacture. It is this single fact which places the greatest demand on the manufacturer and which makes the production of premium quality magnetic tape one of the most exacting tasks in the world.

Mr. Eldridge received the B.S.E.E. degree from Lehigh University, Bethlehem, Pennsylvania, in 1949.

He joined the Boeing Airplane Company, Seattle, Washington, where he engaged in work covering many phases of dynamic data acquisition and reduction. In 1956 he became affiliated with the research division of Ampex Corporation, where he did research on many aspects of magnetic recording. His last position there was head of the magnetics department of the Ampex Corporate Research Division, from which he resigned in December, 1960. He is the author of numerous articles and holds many patents in the field of magnetic recording.

MORE OVERSEAS TIES

Often overlooked is the fact that companies overseas have specialized in precisely those types of products which we are now seeking: commercial and industrial applications of electronics for the medium-size and small user. We, on the other hand, have been pioneers in the technology, thanks to massive government support (which the overseas companies lack). Obviously, there is much to be gained by an exchange between these two diversely oriented groups of manufacturers.

The speaker will outline a five-step approach which utilizes to best advantage the "know-how potential" of Bay Area electronics companies in their dealings with overseas. His observations are based on personal experience during his ten-thousand miles

(Continued on page 12)

The Catalysts. The purpose of the meeting is as old as business itself—a seller and a buyer convening to examine if one has what the other needs. The seller is a technical sales representative; he represents engineering-oriented firms which design and build precision products for specialized markets. The buyer is a manufacturer; he depends upon outside suppliers to supplement his own in-house capabilities. The purpose of the meeting is as old as business itself—but the participants are of a new breed. They're technologists seeking a better product: businessmen dealing in the continuing ascent of the human condition.

meeting ahead

GUNN EFFECT

Dr. Herbert Kroemer, Varian Associates, Palo Alto, will discuss the Gunn effect of microwave oscillations in gallium arsenide at the January 27 meeting of the Electron Devices chapter.

About two years ago, J. B. Gunn of IBM discovered that the current through a crystal of n-type gallium arsenide breaks into microwave oscillations if the applied field exceeds a certain threshold value. Pulsed r.f. outputs of over 40 watts have since been observed around 1 Gc, as well as lower outputs under c.w. conditions, and at high frequencies (up to at least 6.5 Gc). The frequency depends only weakly on the external circuit, but is primarily a function of the crystal thickness, being about inversely proportional to the thickness, as for a transit-time phenomenon. However, evidence is rapidly accumulating that the actual mechanism is one that semiconductor researchers have been looking for since around 1950: a true negative specific conductivity (field-controlled). The transit-time effects arise from the fact that a field-controlled bulk negative conductance is inherently electrically unstable, and must break up into alternating domains of high and low field which travel along the crystal, thus giving rise to a current that oscillates with a frequency inversely proportional to the domain transit time.

The mechanism leading to the negative conductivity is probably one of transferring the electrons into the higher-lying "satellite valleys" of the gallium arsenide band structure, where they have a substantially reduced mobility.

Dr. Kroemer, who received his Ph.D. in physics from the University of Goettingen, originated and published the drift-transistor concept, which forms the basis of all present high-frequency transistors, namely, the concept of a built-in field due to an exponentially graded base resistivity. In 1954, Kroemer joined the RCA Laboratories in Princeton, New Jersey, where he established the feasibility of his ideas experimentally. After the drift-transistor work, Kroemer proposed new semiconductor structures with variable energy gap, particularly greatly improved transistors with a wide-gap emitter; this idea is only now used experimentally in transistors using new materials. During a search for microwave negative-mass carriers in semiconductors he proposed their utilization in microwave amplifiers and generators.

After two years (1957-59) in Germany, where Kroemer headed a semiconductor research group in the newly established German Research Laboratories of the Philips Company, he returned to the United States and has been in the central research laboratories at Varian Associates since June 1959. He now heads a semiconductor research group which is working on a variety of non-conventional (i.e., non-transistor) semiconductor principles.

Kroemer

Sacks

meeting ahead

BLOOD PRESSURE INSTRUMENTS

Dr. Alvin Sacks, head of the hemodynamics section of Vidya Division of Itek Corp., Palo Alto, will discuss blood pressure instruments and what they really measure at the January 18 joint meeting of the Biomedical Engineering chapter and the ISA.

The standard blood pressure cuff has now been in clinical use for something over 60 years. It is a classical example of a simple, reliable, repeatable, sturdy instrument requiring a minimum of calibration. But what precisely does it measure? This has been the subject of a combined experimental and analytical investigation at Vidya Division of Itek for the past three years. Dr. Sacks directed this work and will describe the project.

A large-scale simulated arterial flow system has been built, in which various simulated arteries can be tested at various levels of mean pressure, pulse rate, and pulse pressure. Several arteries have been tested, both with Newtonian fluids and with real blood. The results indicate that the "auscultatory" readings (obtained with a cuff and stethoscope) are always too high by an amount that depends upon the stiffness and thickness of the arterial wall. Therefore, elastic tests have been performed on excised specimens of the human brachial artery, and these results will also be discussed.

The cause of the Korotkoff sounds heard in the stethoscope during blood pressure determinations is still a subject of conjecture. Vidya's theoretical and experimental investigations now indicate that the sounds arise from an elastic instability of the vessel wall. An attempt is now being made to predict the cuff pressures at which the instability may be expected.

meeting ahead

MTT LECTURE SERIES

The first of three lectures on solid-state microwave devices will be presented by C. Louis Cuccia, director, research and engineering, Microwave Electronics Corp., Palo Alto, at the January 21 meeting of the Microwave Theory and Technique chapter; other lectures being scheduled for February 4 and February 23.

Mr. Cuccia, a graduate of the University of Michigan, who has done graduate work in theoretical physics at Princeton University, will present a review of modern low and ultra low noise microwave pre-amplifiers, a comparison of performance data, and mechanical configurations of all types discussed. The talk will conclude with a description of these devices and a comparison of the various trade-offs between weight, noise figure, and saturated power-handling capability which have accounted for their development.

Robert D. Hall, hp associates, will discuss solid state microwave switching on February 4. Donald Geppert, Stanford Research Institute, and Richard Soshea, hp associates, will discuss hot carrier devices on February 23.

meeting ahead

UTILITY COMMUNICATIONS

The increasing importance of communications for improving utility operations will be the subject at the Communications Technology chapter meeting on January 27.

Two engineers will share in describing the very extensive private communication system of the Pacific Gas and Electric Company, showing how it is utilized to improve service and reduce costs. With electric generating stations, transmission and distribution facilities, and with gas pickup and transmission facilities scattered all over the state, and with interconnections with other utilities at several points, instant communications are often vitally necessary. W. I. Emmons, supervising communications engineer, will present the talk, assisted by Donald G. Gregory, communications engineer.

A discussion period will follow presentation of the talk, after which the group will have an opportunity to tour the communication facilities located in the PG&E Headquarters Building at 245 Market Street.

Mr. Emmons graduated from Heald College in 1934 with major in E.E., and started selling Weston electrical instruments. He served more than four years in the Navy and in 1945 began his service with Pacific Gas and Electric Company. He is a registered professional engineer, State of California.

Mr. Gregory graduated from the University of California in 1958 with E.E. as his major. He immediately began work with Pacific Gas and Electric Company in the general construction department, then in the system protection group, transferring into communications in 1963. He is a member of IEEE and a registered professional engineer in the State of California.

MORE OVERSEAS TIES

of travels in Europe during the past years.

An informal tour of the host plant, Granger Associates, will be provided for those interested.

Stephen V. Hart formed Electronics Engineers International in 1960, a group of consulting engineers who reside in ten countries. He is a graduate of the Institute of Technology, Vienna, and a former professor of electrical engineering at University of Connecticut and Swarthmore College. He pioneered industrial electronics developments at RCA, Camden; later became vice president of Electronic Control Corp., Detroit, and manager of research engineering with the Electro-Optical division of Perkin-Elmer Corp., Norwalk, Conn.

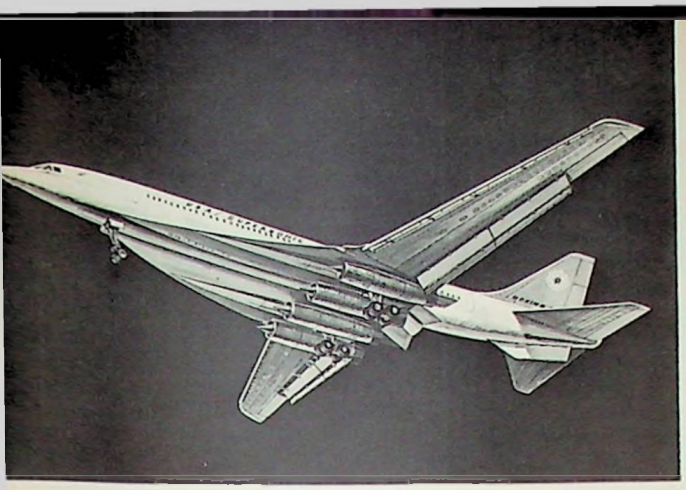
meeting ahead

MORE ON SLAC

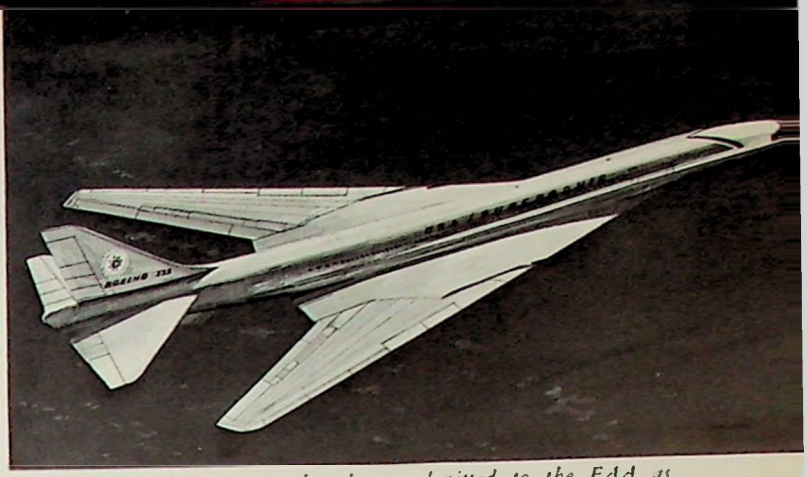
Douglas William Dupen, technical information officer of the Stanford Linear Accelerator, will discuss the project's significance to the nuclear field at the January 25 joint meeting of the East Bay Subsection and the ISA. Special emphasis will be placed on technological problems and the techniques developed to solve them.

The research machine, an aerial view of which is shown on the cover, will be the most powerful electron accelerator ever built and is destined to become one of the most important scientific tools in its field. It is another step along the paradoxical path which requires larger and larger machines to study the structure of matter in smaller and smaller detail. The high energy beam-switching arrangements and efficiently designed research areas will allow experiments to be prepared and operated simultaneously.

Although not scheduled for operation until April, 1967, the accelerator is already known throughout the world. It will be available to scientists from other countries as well as those from the U.S. Its use will be determined by choosing the most promising physics experiments from the many proposed.



BOEING 733-197, the company's version of the Supersonic Transport, is shown (left) with wings extended for subsonic flight or take-off and (right) with wings swept back for supersonic cruising.



Final design, the 733-198, has been submitted to the FAA as Boeing's entry in the SST field. A 30,000-pound payload—150 passengers—will cruise at 60,000 feet.

meeting review

AEROSPACE IN ORBIT

The initial meeting of the San Francisco Aerospace chapter was well attended and featured a talk on the Boeing Supersonic Transport (SST), very ably presented by Boeing's Sidney Wiener, chief of customer engineering. The meeting was arranged by Jim Aldrich, chief electrical engineer of United Air Lines.

Mr. Wiener discussed the many designs that Boeing evaluated, starting back as early as 1951. More than 10,000 hours of wind-tunnel time disclosed that a variable sweep wing would best meet all requirements. Slides were shown of very promising designs which were discarded, one by one, in favor of the final design, the model 733-198. This final design has been submitted to FAA as Boeing's entry in the SST field. The 733-198 will have a wing span of 173 feet with a fuselage length of 203 feet. It will weigh 182,500 pounds empty, carry 235,840 pounds of fuel (35,200 gallons), and, in addition, carry a 30,000-pound payload for 4,000 miles. (This payload is equivalent to roughly 150 passengers plus baggage.)

The construction of the aircraft will be of conventional alloys, with the addition of many Titanium alloys. The skin will be of Titanium alloy because of the high skin temperatures—approximately 500°F.

Much effort went into the design of the wing pivots, and a final design was selected which is hydraulically operated to swing the wings back approximately 70 degrees. The system is quite redundant and studies indicate that failure of the wing sweep-back mechanism will be exceedingly remote. A single cockpit control will be used to vary the wing angle; leading and trailing edge flap positions will be automatically coordinated with sweep-back angle for maximum aerodynamic efficiency.

The 377-198 will cruise at 60,000 to 65,000 feet, with a service ceiling of 80,000 feet. Fully loaded, it will take off in 4,300 feet of runway. Normal take-off speed is 154 knots. Minimum flight control speed is 94 knots. Take-off is actually shorter than the conventional 707 or DC-8 and also considerably quieter in the immediate airport vicinity. It will climb to 60,000 feet in 16.4 minutes; however, it will require 40 minutes to descend. Descent will actually start 275 miles from destination.

The "question and answer" period was lively and interesting. One question, in particular, pertained to landing the aircraft with the wings fully swept aft. The answer was that it would require 8,000 feet of runway with a landing speed of roughly 180 knots. The only difference would be that the aircraft would approach the field in a more nose-up attitude than during a normal landing with the wings extended.

R. W. SUMNER

Morris *Granger*

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grid swings

IT IS REPORTED:

Albert J. Morris, president of Energy Systems, Inc., Palo Alto, has been elected chairman of the S.F. Council of WEMA, succeeding John S. McCullough, vice president and general manager, electron tube division, Litton Industries, San Carlos. Elected vice chairman was E. E. van Bronkhorst, vice president, Hewlett-Packard Co. Jesse R. Lien, vice president and general manager, Sylvania Electric Products, Inc., Mountain View, was named secretary-treasurer. Other directors elected from the council are Kenneth T. Larkin, director of engineering research and development, Lockheed Missiles and Space Co., Sunnyvale; Dr. Dean A. Watkins, president, Watkins-Johnson Co., Palo Alto; and Robert M. Ward, president, Ultek, Palo Alto. Dr. Wendell B. Sell, president of Packard Bell Electronics, Los Angeles, has been elected chairman of the L.A. council; and Walter J. Zable, president of Cubic Corp., San Diego, chairman of the San Diego council.

Dr. John V. N. Granger, president of Granger Associates, Palo Alto, reports highest sales in the company's eight-year history, $5,370,209, up 28 percent over sales of $4,200,267 for 1963.

Albert T. Isaacs has been advanced to manager of tube research and development at Stewart Engineering Co., Santa Cruz.

Alan T. Waterman, Jr., Stanford University, has been elected secretary of the U.S. National Committee of l'Union Radio Scientifique Internationale (URSI) for a triennium. L. A. Manning, Stanford, has been elected editor of the same group and will work with the National Bureau of Standards in the publication "Radio Science."

Waterman

Gundy

John P. Downey has been appointed manager of the newly formed 70-man data processing center of Sylvania Electronic Systems, a division of Sylvania Electric Products, Inc., Mountain View.

Dr. Ralph L. McCreary has been appointed manager of the systems division and elected a vice president of Watkins-Johnson Co., Palo Alto, assuming responsibility for the company's advanced developments in satellite communications, reconnaissance, electronic countermeasures, and surveillance systems.

Robert J. Stahl, former manager of product planning for the western operation of Sylvania Electronic Systems, a division of Sylvania Electric Products Inc., has been appointed to the newly created position of manager of product planning at the main operation in New York.

Phillip L. Gundy has been elected executive vice president of Computer Equipment Corp. of Los Angeles, and John J. Burke and Robert M. Ward have been named to the company's board of directors. Gundy continues as executive vice president of Technical Systems, Inc., a substantial shareholder in Computer Equipment. He is a past president of WEMA, a current director of WESCON, and was a senior vice president of Ampex Corp. before joining Technical Systems in 1963.

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the section

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Senior Member

Edward C. Wood C. V. Weden

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

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book notes

SIEGMAN ON MASERS

A new textbook on masers—the solid-state electronic device for which the 1964 Nobel Prize in Physics was awarded—has been published by a young Stanford expert in the field.

Prof. Anthony E. Siegman's book, "Microwave Solid-state Masers" (583 pp., McGraw-Hill, $18.50), already has received high praise from professional journals. A reviewer in Physics Today wrote:

"Siegman's book is an excellent handbook on microwave solid-state masers, both as a detailed and concise introduction . . . and as a reference book for the scientist. It is quite certain that this book will soon belong to every library . . . containing books on masers and paramagnetic resonance. It is worth the price and will not be out-dated for quite a long time."

Prof. Siegman recently authored a major article on lasers—an extension of masers into the visible light frequencies of the electromagnetic spectrum—for Stanford Today, a university publication. A member of the electrical engineering department, at 33 he is the youngest full professor in the Stanford School of Engineering.

Classified Advertising

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Write or call: Ernesto A. Montano, IEEE Grid, Suite 2210, 701 Welch Rd., Palo Alto. Telephone (415) 327-6622.

section inputs

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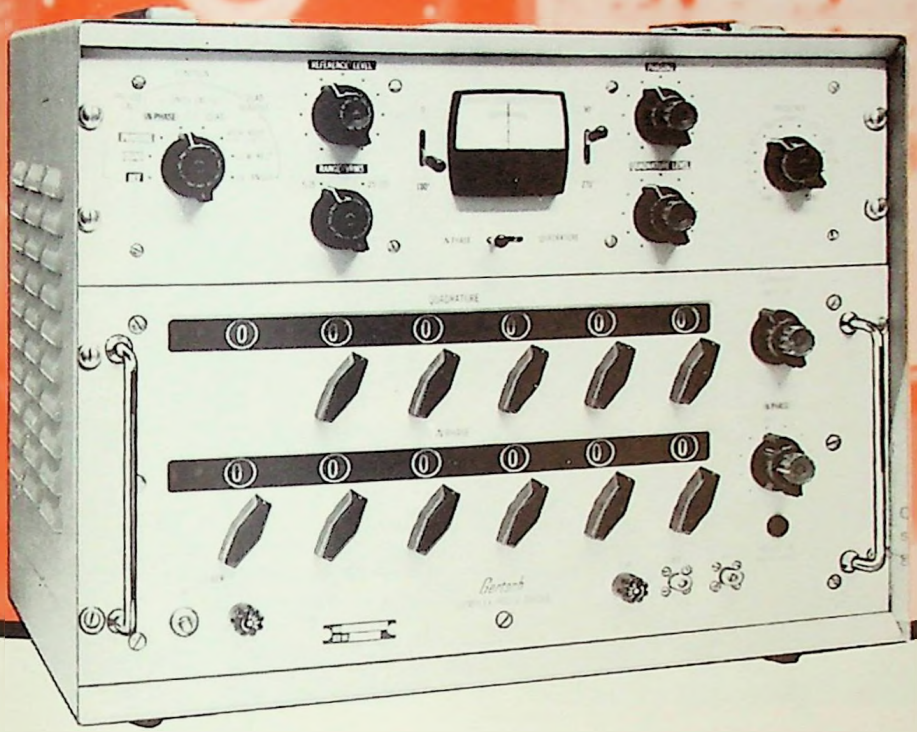

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