EDITOR'S PROFILE of this issue

from a historical perspective …

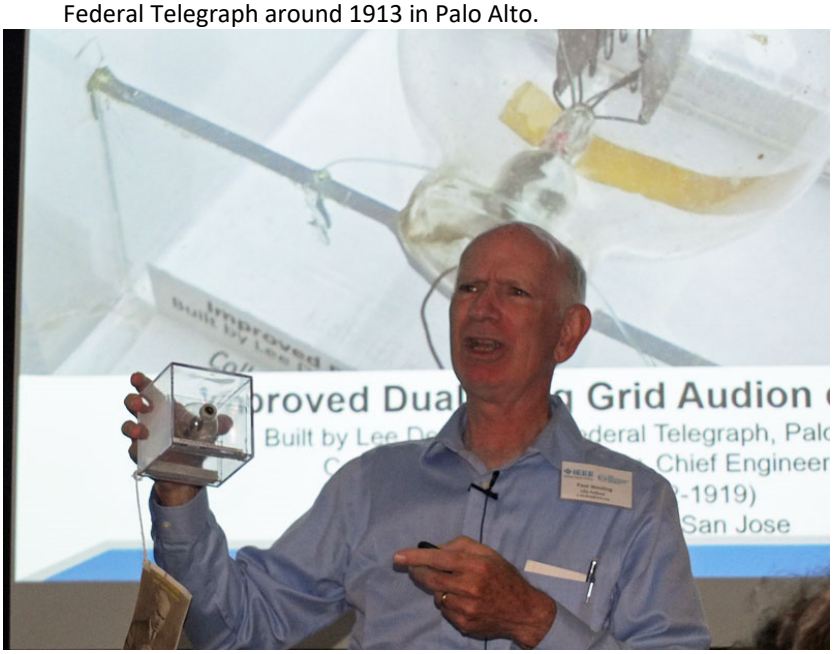
with Paul Wesling, SF Bay Area Council GRID editor (2004-2014)

April, 1965:

Cover: A storage ring for electrons at Stanford's high-energy physics lab. It achieved a collision energy of 360 billion eV.

Page 3: The Foothill Electronics Museum is founded, with plans to place it on the Foothill College campus. It ends up occupying the same building as Foothill's observatory, which I visited several times. It contains the Douglas Perham collection of early radio and electronics artifacts, build up during Perham's years with Federal Telegraph (the Bay Area's first electronics company) from 1911 through 1930. Lee de Forest (inventor of the vacuum tube) worked at Federal Telegraph, where he received patents for the oscillator and amplifier circuits. When Foothill College shut down the museum, the collection was transferred to History San Jose, where I've done some research into its artifacts. They demonstrate the early steps by which the SF Bay Area became "Silicon Valley".

Here's a photo of me with an early Audion vacuum tube, manufactured by Federal Telegraph around 1913 in Palo Alto.



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IEEE Grid

April 1965
SAN FRANCISCO SECTION
INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS

meeting reminder

April 15 (Thursday) East Bay Subsection, Aerospace, Microwave Theory and Techniques

April 16 (Friday) Audio

April 20 (Tuesday) Biomedical Engineering

April 21 (Wednesday) San Francisco Section/Santa Clara Valley Subsection/Industry and General Applications, Military Electronics, Nuclear Science

April 22 (Thursday) Circuit Theory, Electromagnetic Compatibility

April 26 (Monday) East Bay Subsection

April 27 (Tuesday) Automatic Control, Computer, Engineering Management/Product Engineering and Production/Reliability, Power

April 28 (Wednesday) Electron Devices, Instrumentation and Measurement, Space Electronics and Telemetry/Antennas and Propagation

April 29 (Thursday) Information Theory

May 6 (Thursday) Aerospace

May 18 (Tuesday) Industry and General Applications

May 24 (Monday) East Bay Subsection

June 1 (Tuesday) San Francisco Section

POSTMASTER: RETURN REQUESTED—SUITE 2210, 701 WELCH ROAD, PALO ALTO, CALIFORNIA

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meeting review

SPACE CREW MONITORING

A joint meeting of the Aerospace Electronics and Biomedical Engineering chapters was held March 18 at Stanford Research Institute. Dr. S. Lincoln discussed research being done at Lockheed on the many aspects of "crew monitoring" during space flights.

The title of the talk was "Bio-Test Data for Manned Space Flight." This title refers to work being directed by Drs. J. E. Mangelsdorf and Lincoln at Lockheed Missiles and Space Co., Sunnyvale.

Dr. Lincoln opened by noting that crew monitoring applies equally well to undersea exploration, where the environment is every bit as hostile as that of space. He also pointed out that the Lockheed group are carrying out an integrated approach to monitoring and data analysis and that a wide variety of skills and disciplines are being utilized in this project.

The general goals of crew monitoring are:

- Insure the safety of the crew.
- Determine current crew capability.
- Predict future capability of the crew.

Dr. Lincoln indicated that Lockheed has developed an automatic system to perform the above tasks. Although it is physically large now, the size will be reduced later. The system includes a digitizing process, display devices, and a data analyzer.

The following physiological variables are monitored:

- Electrocardiogram (ECG) by a special lead system (lead B).
- Respiration, by the use of impedance pneumograph.
- Skin temperature, by means of a thermistor.
- Blood pressure, by means of the standard arm cuff and inflating device.

A Control Data 160 computer, A to D convertor, and special interface equipment make up the heart of the system.

Some of the many problems of data acquisition and analysis were pointed out by the speaker. Since a high sample rate is employed, large amounts of data are easily collected but the predicted limited bandpass available for physiological monitoring in the future space shots precludes sending this quantity of data from space to earth. Some means of data compression is required. Dr. Lincoln described two data compression techniques which have been investigated: longitudinal data compression and broadside data

Skilling

Fyler

compression. The former can be described as a fixed aperture and only data points which are outside (or inside) this aperture are logged. This approach will not work on pulsatile wave forms such as ECG. For this type of data, the broadside compression must be employed. This technique first reads and stores the data and then replays it through a variable aperture—the size and position of the aperture being controlled by data obtained from the stored signal.

Dr. Lincoln reported that ECG compression ratios of almost 1800 to 1 have been achieved when noise-free signals are monitored. Artifacts due to exercise, etc., can reduce this ratio to 16 to 1; however, in this latter case the compression technique meant the difference between usable information and useless noise.

Thaler

McCann

In addition to physiological monitoring, Drs. Mangelsdorf and Lincoln have developed some unique space crew performance measures. Dr. Lincoln commented on the use of an oscilloscope as an uncomplicated display. A computer generates any display desired on the scope face—painting dots and characters, etc., which are viewed by the subject.

A number of performance tests have been devised. Among them are tracking, vigilance, arithmetic, and perception, as well as a unique maze problem.

The maze was described in some detail and it is unique in that the subject cannot see the maze boundary lines! A dot on the scope face, which is under the control of the subject, must be negotiated through the invisible maze. When the dot changes to a cross, the maze boundaries have been crossed. Each time the dot changes to a cross, the subject is scored with an error. Total score is the product of total time it takes to reach the goal and the number of errors.

(Continued on page 12)

ieee news

CONVENTION HONORS

Three Section members were awarded three of IEEE's highest awards at the March international convention in New York.

They are Prof. Hugh H. Skilling, department of electrical engineering, Stanford University, awarded the IEEE Education Medal; Norman F. Fyler, staff scientist, Litton Industries electron tube division research department, San Carlos, who received the Vladimir K. Zworykin Award; and Prof. George J. Thaler, electrical engineering department, U.S. Naval Postgraduate School, Monterey, presented the Harry Diamond Memorial Award. All three awards include a prize of $500.

Prof. Skilling, whose teaching career began at Stanford in 1926, is a Fellow of the Institute and was honored for outstanding achievement in electrical engineering education. He is currently a visiting professor at King's College, Cambridge University, England.

Mr. Fyler, who joined Litton in 1958, was honored for key contributions to the basic design of color television tubes, the Zworykin award recognizing the most important technical contribution to electronic television during the preceding three calendar years.

Prof. Thaler, who is also a lecturer at the University of Santa Clara and a consultant to IBM, San Jose, has taught at Monterey since 1951. He was honored for outstanding contributions to published literature in the area of linear and non-linear feedback control theory. The Diamond award is presented annually to a person or persons in the government service for outstanding work in the field of radio or electronics.

election news

McCANN WITHDRAWS

James J. McCann, secretary- treasurer of the Power chapter and PG&E administrative engineer, has withdrawn his nomination for Section treasurer for 1965-66, preferring to devote his efforts at this time to continued development of the chapter.

Ballots for the election officers, to be received by the membership in May, will therefore carry only two nominees for treasurer: J. E. Barkle and E. W. Pappenfus.

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contents

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section news

FOOTHILL ELECTRONICS MUSEUM

The Perham Foundation is now moving rapidly ahead with its plans to build the Foothill Electronics Museum, according to Earl Goddard, president of the foundation and chairman of the Section historical committee.

The Perham collection of artifacts and documents, which dates back to the turn of the century, will become the major feature of the museum. This collection was acquired by the foundation from Douglas Perham, who now is retired from the foundation. It was through Perham's foresight that this irreplaceable collection has been preserved for future generations. The entire collection is now in safekeeping in the warehouse of James Transfer and Storage Company in San Jose awaiting construction of the museum.

Goddard also announced that the foundation has been granted Federal non-profit, tax-free, educational foundation status.

The location of the museum will be at Foothill College in Los Altos Hills, Goddard said. Many possible sites were explored, but none had the academic, community, and industry service advantages offered by Foothill College. The museum will become a major part of the Space-Science Center and will be administered by the Foothill College Office of Community Services under the guidance of the board of directors of the foundation.

The museum, as an integral part of the Space-Science Center, will become a focal point in America for the display of not only the Perham collection but also of new achievements in the electronic science. It will be used by the college, by the communities served by the college, and by industry as an educational facility.

The building will be built from funds obtained from industry and indi-

(Continued on page 12)

cover

Smashing electrons together in this pair of high-vacuum "storage rings" at Stanford University's high energy physics laboratory, a Stanford-Princeton research team has achieved unprecedented head-on particle collisions of 360-billion-volt equivalent energies. Surrounding engineer Clarence Noyer is one of the rings in which electrons race at approximately the speed of light, guided by the massive electromagnets surrounding it. The research is designed to test some of our most fundamental concepts of matter, and has been supported by the Office of Naval Research and the U.S. Atomic Energy Commission.

Thompson

Leihy

meeting ahead

2ND ANNUAL PIONEERS' NIGHT

Five electrical engineering and manufacturing pioneers will form a panel for the second annual "Pioneers' Night" presented by the Section, the Santa Clara Valley Subsection, and the Industry & General Applications chapter on April 21. A highly successful meeting with a similar panel was presented last year by the Subsection in cooperation with the Section.

The panel, moderated by Brodie Leihy, publisher of "Electrical West" and "Energy International," will consist of Joseph S. Thompson, founder of Pacific Electric Mfg. Co.; Almon W. Copley, retired Westinghouse engineer; Charles V. Litton, president, Litton Engineering Labs; Walter Schymic, retired design engineer; and J. W. Culverwell, retired, Koetick Mfg. Co.

A free-wheeling, humorous, and informative series of reminiscences is expected, according to Art Wells, who arranged the program for the dinner meeting, which will take place in the Executive Suite of Rickeys Hyatt House, Palo Alto. Cocktails at 5:30 will be followed by dinner at 6:30. Reservations by April 19.

meeting ahead

APRIL POWER MEETING

A joint meeting of the Power chapter and the ASME San Francisco Section will be held on April 27 at the Engineers' Club. The subject will be digital computers as applied to Pacific Gas & Electric Company's Contra Costa and Moss Landing generating stations.

Robert Vierra, electrical engineer, PG&E, will discuss and present slides describing the Contra Costa generating plant and computer installation. He will give a functional description of the computer, computer hardware (components), and computer software (programming), as well as the problems encountered in the installation and check-out of the system.

James Rocca, mechanical engineer, PG&E, will discuss in some detail the Moss Landing plant, the computer advances made, and the operating experience gained at Contra Costa.

MEETING CALENDAR

SAN FRANCISCO SECTION

8:00 P.M. • Wednesday, April 21

(Joint with Santa Clara Valley Subsection and Industry and General Applications, see below)

Pioneers of electronic and electrical engineering and manufacturing (a panel discussion on early engineering by the pioneers themselves)

Moderator: Brodie Leihy, publisher, Electrical West, San Francisco; Panel: Joseph S. Thompson, founder, Pacific Electric; Almon W. Copley, retired, Westinghouse; Charles V. Litton, president, Litton Engr. Labs; Walter Schymic, retired, design engineer.

Election of 1965-66 SCVS officers

Place: Executive Suite, Rickeys Hyatt House, Palo Alto
Cocktails: (no host) 5:30 P.M.
Dinner: 6:30 P.M., $4.25 each; ladies welcome
Reservations: San Francisco Section office, 327-6622, or Art Wells, JU 6-4074, in San Francisco, by April 19

SAN FRANCISCO SECTION

6:00 P.M. • Tuesday, June 1

Annual meeting honoring 1965 Fellows and Prize Winners; installation of 1965-66 Section Officers

Project Gemini to be discussed by a NASA expert

Place: Palo Alto Cabaña, Circus Maximus Room
Social Hour: 6:00 P.M.
Dinner: 7:00 P.M. Roast sirloin of beef, $5.75, including tax and tip
Reservations: Mrs. Helmke, Section Office, 327-6622, by May 28
Tables of ten may be reserved for Subsections, Chapters, Committees and Companies

SANTA CLARA VALLEY SUBSECTION

8:00 P.M. • Wednesday, April 21

(Joint with San Francisco Section and IGA, see above)

EAST BAY SUBSECTION

7:30 P.M. • Thursday, April 15

Father-and-Son night, and awards to high school student paper contest winners
Thinking machines
Dr. Edward Teller, University of California, Berkeley
Place: PG&E meeting room, 4801 Oakport, Oakland (west of Nimitz Freeway between High Street and Hegenberger Road)
No dinner

EAST BAY SUBSECTION

7:30 P.M. • Monday, April 26

Field trip and talk
New concepts in electrolytic tin plating
S. W. Lanstrom, tin mill assistant, general foreman, U.S. Steel; Jack Crawford, electrical staff engineer, U.S. Steel
Place: U.S. Steel plant, Pittsburg
No dinner

EAST BAY SUBSECTION

8:00 P.M. • Monday, May 24

Annual ladies night and installation of officers
Plowshare—status and problems
Dr. Gerald W. Johnson, associate director, LRL Plowshare program
Place: Kaiser Center, 300 Lakeside Drive, Oakland
Dinner: 7:00 P.M., Kaiser Center banquet room
Reservations: Frank Chandler, OL 2-3770, by May 19

GROUP CHAPTERS

Aerospace

8:00 P.M. • Thursday, April 15

One megawatt nuclear-electric power for space mission (SNAP 50/SPUR)
G. E. Rich, research specialist, LMSC, Sunnyvale
Place: Lockheed Auditorium, Bldg. 202, 3251 Hanover Street, Palo Alto
No dinner

MEETING CALENDAR

Aerospace

8:00 P.M. • Thursday, May 6

Project Pioneer
Howard F. Mathews, assistant manager, Project Pioneer
Place: Ames Research Center, Moffett Field, Mountain View; conference room on second floor of Data Reduction Building. Enter main gate and take FIRST TURN TO LEFT. Mention IEEE Aerospace meeting to Guard.
No dinner

Antennas and Propagation

8:15 P.M. • Wednesday, April 28

(Joint with SET, see below)

Audio

8:15 P.M. • Friday, April 16

Medieval to modern loudspeakers
Paul W. Klipsch
Place: Radio Physics Laboratory, SRI, Bldg. 402, Laurel St. at Mielke Dr., Menlo Park
Cocktails: 6:00 P.M.
Dinner: 6:30 P.M., Ramor Oaks, El Camino Real, Atherton
Reservations: Herb Ragle, 248-3344, Ext. 260

Automatic Control

8:00 P.M. • Tuesday, April 27

Comparison of the linear feedback system with the self-oscillatory adaptive system
Isaac M. Horowitz, senior scientist, Hughes Aircraft Co., Culver City
Place: University of Santa Clara, Engineering Center, Room 551
Dinner: 6:30 P.M., Faculty Club, University of Santa Clara
Reservations: Mrs. McKenna, AX 6-3360, Ext. 226, by April 26

Biomedical Engineering

8:00 P.M. • Tuesday, April 20

Electrical analgesia in the rat
Dr. David V. Reynolds, research psychologist, SRI
Place: Stanford Medical School, Room M-112
Dinner: 6:15 P.M., Red Cottage, El Camino Real, Menlo Park
Reservations: Ellen Campbell, 326-6200, Ext. 3372, by April 19

Circuit Theory

8:00 P.M. • Thursday, April 22

Impedance matrix synthesis
Dr. T. J. Harrison, IBM, San Jose
Place: Main conference room, SRI, 333 Ravenswood Avenue, Menlo Park
Dinner: 6:00 P.M., Stone Cellar, 1906 El Camino Real, Menlo Park
Reservations: Mrs. Kelley, 326-6200, Ext. 3285, by April 21

Computer

8:00 P.M. • Tuesday, April 27

Flexibility—a new dimension in monolithic digital circuits
Dr. Robert B. Seeds, Fairchild Semiconductor, Palo Alto
Place: GE Computer Lab, 310 DeGuigne Drive, Sunnyvale
Dinner: 6:30 P.M., Old Plantation, El Camino Real and Bernardo, Sunnyvale
No reservations required

Electromagnetic Compatibility

8:00 P.M. • Thursday, April 22

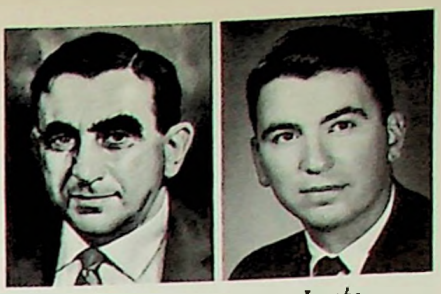
1. Discussion of 1966 National Symposium
2. A paper to be presented (author unknown)
Place: Lockheed Auditorium, Bldg. 202, 3251 Hanover Street, Palo Alto
No dinner

Electron Devices

8:00 P.M. • Wednesday, April 28

Micron-size vacuum electron devices
Louis N. Heynick, senior research physicist, SRI
Place: PH 101, Stanford University
Dinner: 6:00 P.M., Red Cottage, El Camino Real, Menlo Park
Reservations: Mrs. Williams, 854-3300, Ext. 557, by April 27

(Continued on page 6)



Teller *Jacobs*

meeting ahead

TELLER ON THINKING MACHINES

Dr. Edward Teller, eminent professor-at-large at the University of California and chairman of the newly formed department of applied science at Davis and Livermore, will be the guest speaker at the April 15 meeting of the East Bay Subsection. The father-and-son-night meeting, to which wives and daughters are invited, will also feature awards to high school student paper winners.

A committee solicited papers from 43 high schools in Alameda, Contra Costa, and Solano counties in the fields of electronics, electricity, magnetism, radio, and television. The awards consist of a scholarship to the winner and a variety of other prizes to the runners-up. Other entrants will be given a certificate of acknowledgment.

Scholarship funds and prizes have been donated by the following firms in the East Bay Subsection area:

Dow Chemical Co.; Electro Engineering Works; Friden, Inc.; Kaiser Engineers; Knopp, Inc.; National Electric Coil Co.; Nourse Equipment Co.; S. E. Johnson, Consulting Engineer; Systron Donner; U.S. Steel; and Westinghouse Electric Corp.

meeting ahead

SEQUENTIAL DECODING

Prof. Irwin M. Jacobs of M.I.T. will address the April 29 meeting of the Information Theory chapter. "Sequential Decoding — the Computational Problem" will be his subject, referring to a search procedure for locating that path in a tree code which is closest to some noisy-received sequence. The Fano algorithm, the most promising of the sequential procedures thus far suggested, both for ease of analysis and implementation, will be introduced in terms of two simplified flow diagrams.

The advantages of sequential decoding—measured in terms of energy-per-bit required for a specified level of system performance—depend heavily upon the channel and the modem. Results will be presented for antipodal and orthogonal signaling on the additive Gaussian noise channel, and several receiver strategies compared.

Matthews

Harris

meeting ahead

PIONEER SATELLITE

"Project Pioneer" will be the subject of the May 6 meeting of the Aerospace chapter. Howard F. Matthews, assistant manager of Project Pioneer, Ames Research Center, will describe this satellite. (Entrance should be made by the main gate at Moffett Field; take first left turn to west side of Bush Circle.)

The Pioneer satellite is one of a family of solar probes designed to study our sun. The initial launch is to take advantage of the "International Year of the Quiet Sun," a period of minimum solar disturbances. It will carry payloads and experiments to measure electron particles, cosmic energies, magnetic fields, electron and proton densities, as well as to detect and record "space dust." Pioneer will have an elliptical orbit ranging—in distance from the sun—from 74 million miles out to 112 million miles. During its 6-month lifetime, it will have communications capability of 90 million miles. Mr. Matthews will present the history of the project, and will describe the experiments, trajectories, sub-systems, tracking sites, telemetry, and other details.

meeting ahead

FM LASER OSCILLATION

Prof. Stephen E. Harris of the electrical engineering department at Stanford University will address the Microwave Theory & Techniques chapter on April 15.

Considered will be a type of laser oscillation wherein the laser modes oscillate with approximately FM phases and nearly Bessel function amplitudes, and thereby comprise the sidebands of a frequency-modulated light signal.

Since becoming a member of the Stanford faculty in 1963, Prof. Harris has been working on the development of synthesis techniques for optical networks, and on studying the effects of time-varying perturbations on laser oscillators.

MEETING CALENDAR

Engineering Management

8:00 P.M. • Tuesday, April 27

(Joint with Reliability and Product Engineering and Production, see below)
Management tradeoffs in today's reliability programs (panel discussion)
Place: Physics Lecture Hall (PH 101) Stanford University
Dinner: 6:15 P.M., Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto
Reservations: 326-6200, Ext. 2550, by April 26

Information Theory

8:10 P.M. • Thursday, April 29

Sequential decoding—the computational problem
Prof. I. Jacobs, MIT and Jet Propulsion Labs
Place: SRI Conference Room B, 333 Ravenswood Avenue, Menlo Park
Dinner: 6:20 P.M., Red Cottage, El Camino Real, Menlo Park
Reservations: Barbara Serrano, 321-3300, Ext. 450, by April 29

Industry and General Applications

8:00 P.M. • Wednesday, April 21

(Joint with SF Section and SCV Subsection, see above)

Industry and General Applications

7:30 P.M. • Tuesday, May 18

Direct digital control for industrial processes
Frank Willard, advisory engineer of Westinghouse, computer system department
Place: Engineers' Club of San Francisco
Cocktails: 5:30 P.M.
Dinner: 6:30 P.M.
Reservations: Alex Tseng, 854-3300, Ext. 534 (Peninsula), Dan McDade, 761-1360 (San Francisco), by May 17

Instrumentation and Measurement

8:15 P.M. • Wednesday, April 28

Infrared instrumentation for non-destructive testing
Jerry Patterson, electronic research engineer, LMSC, Sunnyvale
Place: Hewlett-Packard, Bldg. 1, 1501 Page Mill Road, Palo Alto
Dinner: 6:15 P.M., L'Omelette, El Camino Real, Palo Alto
No reservations required

Microwave Theory and Techniques

8:00 P.M. • Thursday, April 15

FM laser oscillation
Dr. Stephen E. Harris, assistant professor of EE, Stanford
Place: Room 1A, Hewlett-Packard, 1501 Page Mill Road, Palo Alto
Dinner: 6:30 P.M., Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto
Reservations: Bob Prickett, 326-7000, Ext. 2666, by April 13

Military Electronics

8:00 P.M. • Wednesday, April 21

Air Force systems command presentation
Major Francis R. MacKenzie, U.S. Air Force
Place: Lockheed Auditorium, Bldg. 202, 3251 Hanover Street, Palo Alto
Dinner: 6:30 P.M., Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto
Reservations: Ralph Franks, 743-0525, by April 20

Nuclear Science

8:00 P.M. • Wednesday, April 21

Fact and fantasy in controlled fusion research
Dr. Richard Freeman Post
Place: Hap's Restaurant, 122 W. Neal, Pleasanton
Dinner: 6:30 P.M.
Reservations: 447-1100, Ext. 8011, by April 20

Power

7:30 P.M. • Tuesday, April 27

(Joint meeting with San Francisco Section, ASME)
Digital computers applied to PG&E's Contra Costa and Moss Landing generating stations
Robert H. Vierra, electrical engineer, PG&E; and James V. Rocca, mechanical engineer, PG&E
Place: Engineers' Club of San Francisco, 206 Sansome Street, 15th floor
Cocktails: 5:30 P.M.; Dinner, 6:30 P.M.
Reservations: 421-3184 by April 24

Product Engineering and Production
8:00 P.M. • Tuesday, April 27
(Joint with Engineering Management and Reliability, see above)

Reliability
8:00 P.M. • Tuesday, April 27
(Joint with Engineering Management and PEP, see above)

Space Electronics and Telemetry
8:15 P.M. • Wednesday, April 28
(Joint with Antennas and Propagation, see above)
Real time data processing for atmosphere explorer spacecraft
McLean Grant, flight systems test engineer, NASA, Goddard Space Flight Center
Place: Lockheed Auditorium, Bldg. 202, 3251 Hanover Street, Palo Alto
Dinner: 6:15 P.M., El Camino Bowl, 2025 El Camino Real, Mountain View
Reservations: Chuck Jamgotchian, 697-7774, by noon, April 28

meeting ahead

ELECTRICAL ANALGESIA

It has been known for some time that certain electric currents applied to the brain (usually by means of surface electrodes on the skull) can produce anesthesia (an unconscious state) or general analgesia (insensitivity to pain while conscious). Although the theory for this effect has not been established, electrical anesthesia is beginning to be used with humans.

At the April meeting of the Biomedical Engineering chapter, Dr. David V. Reynolds of Stanford Research Institute will describe his experiments with electrical stimulation of the brain in the rat. Dr. Reynolds became familiar with the principles of electrical anesthesia (sometimes called "electronarcosis") at the University of California Medical Center in San Francisco, and performed the rat experiments at NASA-Ames Laboratory as a research associate for the National Academy of Sciences.

In an attempt to localize the source of the analgesia phenomenon, Dr. Reynolds used implanted electrodes inserted into the brain. As increasing electric currents are applied through these electrodes, tests are administered to determine the pain threshold. After the elevation of the threshold is established, surgery is performed. Dr. Reynolds will show a film of this experiment and summarize the results of his work.

Electrical anesthesia and analgesia could provide man freedom from pain during surgery or illness without the side-effects of chemical means. Here it is tested on a NASA rat.

meeting ahead

RELIABILITY

"Management Tradeoffs in Today's Reliability Programs" will be the subject of a panel discussion at the April 27 joint meeting of the Engineering Management, Reliability, and Product Engineering & Production.

The government wants the moon, everyone likes the satisfaction of a job done well, but the project will go to a competitor if the costs aren't cut to the bone. This infernal triangle is now so familiar that coping with it has become a way of life. In spite of polished axioms such as "Reliability doesn't cost, it pays," there are few who can face the requirements of all-out reliability efforts, such as the "zero defect program," without being seriously concerned about the cost.

On this panel will be managers from government, aerospace, and commercial manufacturing who are faced daily with practical decisions about reliability engineering from these oft-conflicting points of view. Each speaker will make a brief statement of his operating philosophy and may submit problems for group discussion. These problems, together with cost-vs.-reliability questions introduced by the moderator, will be reviewed by the panel with the objectives of increasing understanding and of developing mutually agreeable operating procedures.

Moderator will be H. Myrl Stearns, director and consultant, Varian Associates. Panelists will be John R. Mulkern, Ames, NASA; Mervin Fitzer, Ampex Corp.; E. L. Woodhams, Lockheed Missiles and Space Co.; and Richard W. Towle, Advanced Technology Labs, American Standard Co.

meeting ahead

NUCLEAR SCIENCE

Fact and fantasy in controlled fusion research will be the subject of Dr. Richard F. Post at the April 21 meeting of the Nuclear Science chapter.

Dr. Post, physicist at Lawrence Radiation Laboratory, Livermore, will discuss some aspects of the research effort to achieve controlled fusion power. The talk will attempt both to prompt the real problems in the research today, and to explode some myths. Illustrations of experimental and theoretical attacks now being pursued toward solving this problem will be drawn from the LRL controlled fusion research program, a part of the U.S. Atomic Energy Commission's Project Sherwood.

Post

Grant

meeting ahead

SET AND AP JOINT MEET

McLean M. Grant, electronic systems integration engineer, NASA, Goddard Space Flight Center, will address a joint meeting of the Space Electronics & Telemetry and Antennas & Propagation chapters on April 28. His subject will be "Real-time Data Processing for Atmosphere Explorer Spacecraft."

Real-time evaluation, the telemetry data link, and the in-line use of general purpose digital computers are key areas of consideration in development of systems for reduction and presentation of data from the atmosphere structure satellites (Explorer XVII and Atmosphere Explorer-B). Data acquisition through the normal telemetry RF link, real-time operation, and comprehensive data display are presented as the most effective means for performance evaluation of these spacecraft systems. Explorer XVII and Atmosphere Explorer-B transmit PCM/PM data at a bit rate of 8640 bits/sec in similar formats. The importance of these formats in the data processing system and development of test stand systems for the two spacecraft are discussed in detail. Current developments and considerations for increasing the real-time evaluation capability are presented.

meeting ahead

MICRON-SIZE DEVICES

Louis N. Heynick, senior research physicist, Stanford Research Institute, will discuss micron-size vacuum electron devices at the April 28 meeting of the Electron Devices chapter.

The devices and circuits thereof, prepared solely from refractory metals and insulators by depositing and micromachining thin films in appropriate sequence entirely under ultra-high-vacuum conditions, may yield otherwise unattainable uniformity, stability, and reliability in systems containing large numbers of components. Current research on several kinds of vacuum devices and on the techniques for producing them are described.

meeting ahead

AUTOMATIC CONTROL

Isaac M. Horowitz, senior scientist, Hughes Aircraft Co., Culver City, will address the Automatic Control chapter on April 27. Comparison of the linear feedback system with the self-oscillating adaptive system will be his subject. A member of the guidance and controls division at Hughes, the speaker holds degrees from the University of Manitoba, M.I.T., and the Polytechnic Institute of Brooklyn, having been an assistant professor at the latter institution from 1956 to 1958. He was on the staff of Hughes Research Labs., Malibu, from 1958 to 1962.

meeting ahead

USAF SYSTEMS COMMAND

Major Francis R. MacKenzie, USAF, will make a presentation on the Air Force Systems Command at the April 21 meeting of the Military Electronics chapter. The motion picture and slide presentation describes the command's divisions and centers at bases throughout the nation, and shows their part in Air Force aircraft, missile, space, electronics, and research programs.

Horowitz

Rich

meeting ahead

SNAP 50/SPUR

The Aerospace chatper will present a meeting on the subject of nuclear-electric power generation for space missions in the one megawatt range on April 15. This program is known as "SNAP 50/SPUR." The speaker will be G. E. Rich, who heads the R & D power engineering organization at Lockheed Missiles and Space Company, Sunnyvale.

As space mission planning becomes more sophisticated, the on-board power demands for spacecraft are increasing. The SNAP 50/SPUR (system for nuclear auxiliary power/space power unit reactor) represents the largest and most advanced space electrical power system thus far advanced for development with an output potential in the megawatt range for a year or more. Recent government interest has accentuated the importance of on-board electrical power subsystem selection for advanced space projects. Lockheed is participating in advanced power system mission utilization studies. These efforts involve the preliminary integration of advanced nuclear power systems into representative missions, i.e., primary and auxiliary radiators, mission equipment radiators, launch vehicles, mission orbits and trajectories, and spacecraft design and operational considerations unique to nuclear-electric power systems.

Many missions have been advanced for SNAP 50/SPUR. These include such diverse uses as earth-centered military satellites, electrically propelled interplanetary spacecraft, and lunar base power. Mission implementation being considered is 1975 to 1990. Representative SNAP 50/SPUR missions have been selected for this discussion:

- 300 KW development flight test.
- Earth-centered military missions.
- 1.2 megawatt unmanned interplanetary probe.

Power plant, mission subsystem, and spacecraft integration will be treated.

Mr. Rich is well qualified to present the results of the above studies. He received his B.S. in Mechanical Engineering at the University of California

(Continued on page 10)

Harrison

Klipsch

meeting ahead

U.S. STEEL FIELD TRIP

A field trip to an operating steel mill is planned for the April 26 meeting of the East Bay Subsection. The latest control techniques in operation will be seen during the tour of U.S. Steel's tinplate mill in Pittsburg.

Members will assemble in the administration building at 7:30 for an introductory discussion by Jack Crawford, electrical staff engineer. Sig Lanstrom, assistant general foreman of the tin finishing mill, will discuss the computer used for process data logging and the control of tin reflow by induction heating. Small groups will then tour the plant, guided by manufacturers' representatives and company specialists.

To get to the mill, take state route 24 from Oakland to Pittsburg. Get off the freeway at Loveridge Road (the exit after Railroad Ave.) and turn left. Follow Loveridge Road past mill to administrative building.

meeting ahead

COMPUTER CHAPTER

Dr. Robert B. Seeds, manager of integrated digital device and circuit development in the R&D lab of Fairchild Semiconductor, Palo Alto, will discuss flexibility—a new dimension in monolithic digital circuits—at the April 27 meeting of the Computer chapter.

Originally felt to constrain the circuit designer, new developments in silicon integrated technology offer the digital circuit engineer a very flexible set of working tools and a new challenge to his ingenuity.

MORE SNAP

in 1952; he then studied Fluid Mechanics and Thermodynamics at U.C. in 1955, then to Stanford in 1959 to study research management. In 1961, he took a U.C. extension course in Atomic Structure, Nuclear Physics. He holds 13 U.S. patents issued and 15 applications pending in fields of Thermoelectric power generation, heat storage, electromechanical and sealing devices. He is also the author of many technical publications.

Nonmembers and interested public are cordially welcome.

meeting ahead

HISTORY OF SPEAKERS

Paul W. Klipsch, president of Klipsch & Associates, Inc., Hope, Ark., manufacturer of loudspeakers, will address a joint meeting of the Audio chapter, the Audio Engineering Society, and the Acoustical Society of America on April 16.

His talk, covering medieval to modern loudspeakers, will start with the ancient loudspeakers in early phonographs and the "medieval" versions requiring vacuum tubes and dating from about 1920. Response curves will be presented and selected samples demonstrated.

"The era does not correlate with quality," Mr. Klipsch says. "There are some remarkable loudspeakers dating about 1930, and some pretty bad ones perpetrated currently. Claims of 'major breakthroughs' notwithstanding, the laws of physics have not been repealed."

The speaker is the author of papers and holds patents in the fields of geophysics, acoustics, firearms, et al. He is a Fellow of IEEE and the Audio Engineering Society.

events of interest

RURAL ELECTRIFICATION

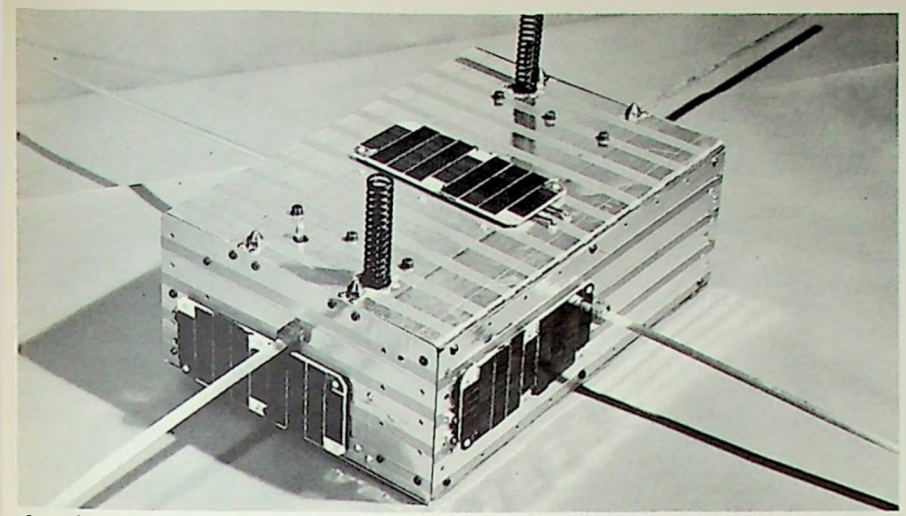
The Ninth Annual Conference on Rural Electrification will be held May 24-25 at the St. Francis Hotel in San Francisco. It is being sponsored by the Rural Electrification committee of the IEEE Industry and General Applications Group. Frank C. Miramontes, Pacific Gas & Electric Company, is the general chairman of the conference.

The theme of the conference will be "Quality on Rural Systems," and approximately 15 invited technical papers will be presented at four sessions covering the following subjects:

- Underground distribution
- System voltage improvements
- Large motors on rural lines
- Electrical applications

Registration fees are $5.00 for members and $6.00 for nonmembers. Further information concerning registration can be obtained from W. T. Neikirk, Line Materials Industries, 360 Shore Road, South San Francisco, California, 94080, 761-0630.

For further information contact: Frank C. Miramontes, conference chairman, Pacific Gas & Electric Company, Room 403, 245 Market St., San Francisco 94106, 781-4211, Ext. 2482, or Arthur W. Mulborn, chairman, publicity committee, Pacific Gas & Electric Company, 245 Market St., San Francisco 94106, 781-4211, Ext. 2932.



Launched into orbit on March 9, the homemade radio amateur satellite is in a 502-mile, 103-minute orbit about the earth. OSCAR III was constructed by San Francisco Peninsula radio amateurs of Project OSCAR, a radio "ham" organization.

space ham news

HOMEMADE SATELLITE

Radio amateurs are smashing communications records and contacting each other across oceans and continents on a "line-of-sight" frequency band by means of a homemade repeater satellite whirling 500 miles above the earth in a 103-minute orbit.

Built by radio amateurs, the OSCAR III satellite is the first multiple-access, linear translator satellite to be placed in orbit. William I. Orr, W6SAI (Menlo Park), is president of the Project OSCAR Association, builders of the satellite. "OSCAR III is a success far beyond our greatest expectations," he said.

Carried as a passenger into space aboard a research and development vehicle of the U.S. Air Force on March 9, the 35-pound "ham" satellite is breaking radio amateur communications records on virtually every orbit about the earth. Operating in the normally "line-of-sight" 2-meter radio amateur band, the OSCAR III satellite has permitted two-way radio amateur conversations between Massachusetts and Germany, between New York and California, between California and Hawaii, between California and Argentina, and between California and Alaska. Contacts between other states are also being made. In addition, numerous European radio amateurs in Switzerland, Germany, England, Sweden, France, and Czechoslovakia are communicating via the OSCAR III. Late news from Australia indicates that radio amateurs "down under" are using OSCAR III for communication.

"The translator equipment aboard the OSCAR III radio amateur repeater satellite appears to be working normally," said Lance Ginner, K6GSJ (Palo Alto), coordinating manager of Project OSCAR. A secondary beacon transmitter on the satellite, however, is not working. The main telemetry transmitter on 145.85 megacycles is returning excellent data to the OSCAR monitoring stations, and tells us that OSCAR III is in good condition," said Ginner.

"The OSCAR III radio amateur satellite operates in the 2-meter inter-

(Continued on page 12)

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television news

CHANNEL 9 SERIES

"Science and Engineering Television Journal," a series of twenty programs planned to post scientists and engineers as well as the interested layman on the latest developments in these fields is seen at 10:00 p.m., Fridays, on KQED, Channel 9, the Bay Area's community-sponsored television station. The series is basically designed to close the communications gap between the various scientific and engineering disciplines. IEEE sponsored the program on traffic control techniques, soon to be telecast.

Underwritten by the National Science Foundation and the Timken Roller Bearing Company, the "TV Journal" programs are coordinated by the American Association for the Advancement of Science in cooperation with twenty scientific and engineering societies.

MORE ELECTRONICS MUSEUM

viduals by the foundation. It will be deeded to the college, which in turn will lease the museum to the foundation for $1 per year.

Plans call for the museum building to contain 5,000 square feet for display, restoration, lecture, and office use. Its architectural design will be similar to the style for which Foothill College is now famous.

The directors have set a fund-raising budget of $250,000. Of this, $111,000 will be for construction and $139,000 will be for operating and staffing the museum for the first five years. To direct the fund-raising drive, the board has appointed Jack Doscher of John R. Doscher and Associates of Los Altos.

A major industry-wide kickoff affair is planned at Foothill College on April 29 in conjunction with the dedication of the new observatory in the Space-Science Center on the campus. An open house at the observatory in the late afternoon will precede the dedication. Dinner at the college will follow and, at that time, plans for the Foothill Electronics Museum will be unveiled. All IEEE members and friends are invited to attend. Dinner reservations may be made through Mr. Doscher's office, 948-9452, or through the Section office, 327-6622.

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MORE OSCAR

national amateur radio band, normally used for short-distance, line-of-sight communication," said William Orr. "These so-called 'very high frequency' (VHF) radio waves are not reflected back to earth by the ionosphere as are the 'short waves' used for long-distance communication. The VHF waves therefore exhibit a very limited communication range under normal circumstances. OSCAR III provides an electronic 'radio mirror' in the sky to reflect VHF signals back to earth: it receives VHF amateur signals, amplifies them, and instantaneously retransmits them back to earth. It can 'hear' amateur signals up to several thousand miles away, and can retransmit them an equal distance."

First indication of successful orbit of OSCAR III was reception of the telemetry signals by Ginner, one of the builders of the satellite. "It was a thrill to hear signals from equipment that I had helped to build," Ginner said.

MORE MEETING REVIEW

Dr. Lincoln pointed out that the use of a computer to generate and score performance tasks has some marked advantages:

- Characteristics of the tasks can be easily changed.
- New tasks can be added without rebuilding.
- Computer programs can generate stimulus material and control timing.
- Typewritten copies of the tests results are available immediately.

Dr. Lincoln said that the entire system is still not fully integrated, but that a few experiments have been run. They plan to monitor man while under stress soon and plan to widen the physiological measures to include electroencephalograms, electromyograms, cardiac output, and pulse wave velocity.

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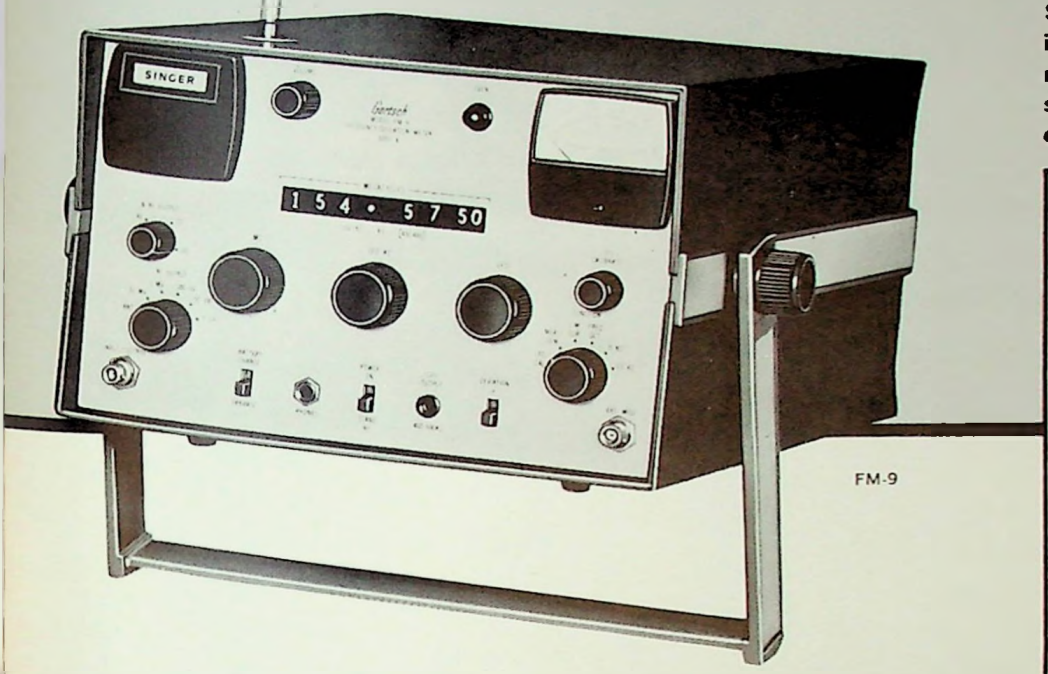

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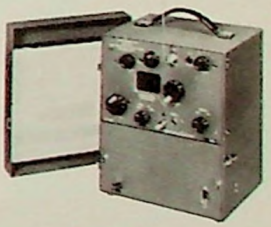

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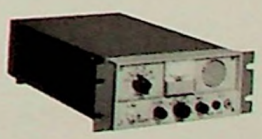

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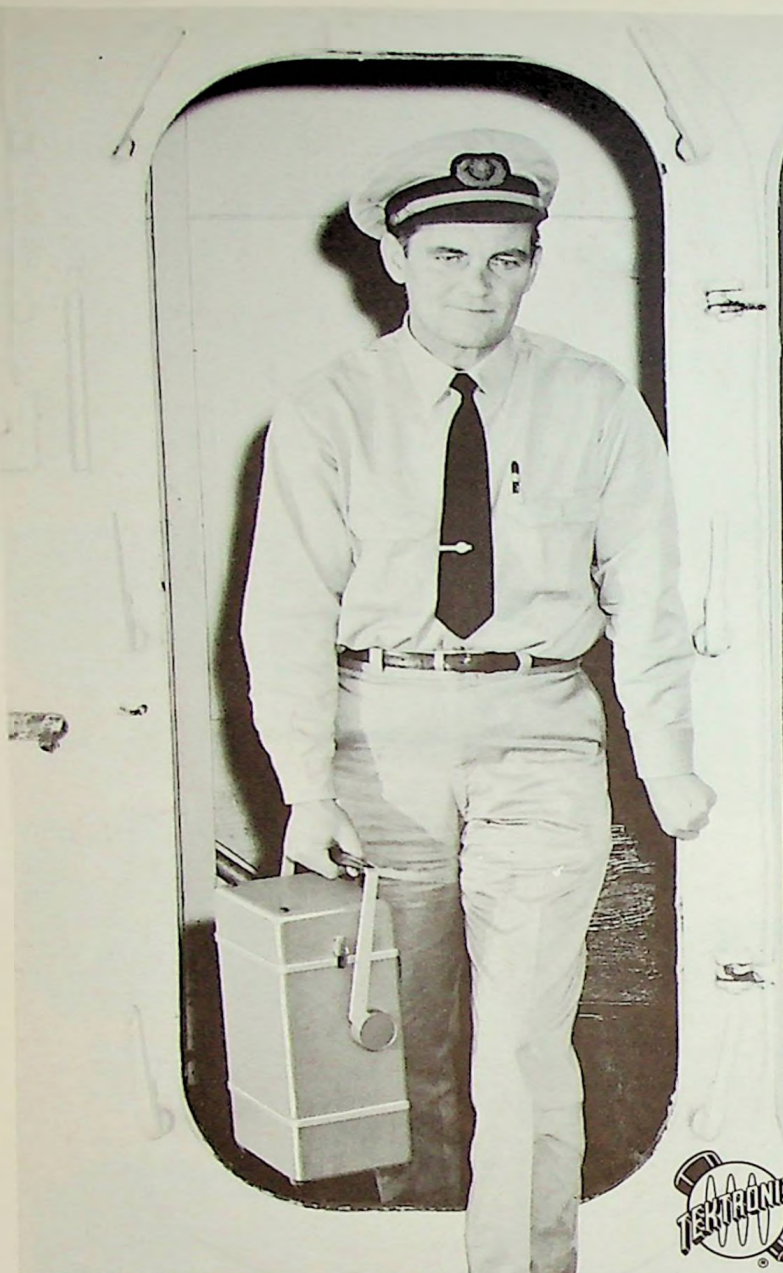

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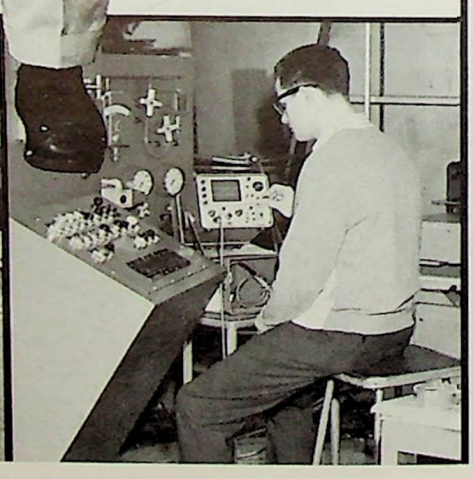

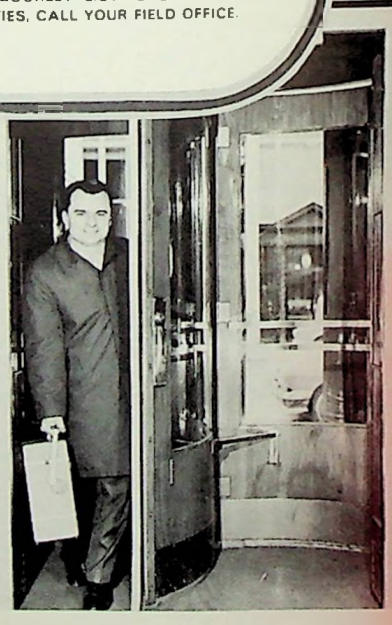

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