EDITOR'S PROFILE of this issue

from a historical perspective …

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

March, 1965:

Cover: The cover caption is the theme of the Region 6 conference being held in Las Vegas. More details on page 3.

Page 10: Bernard Oliver of Hewlett-Packard Company is elected president of IEEE for 1965. In 1955, as head of R&D for H-P, he stopped by a young Charles Eldon's desk and said "Bill wants you to start a new IRE Group on Product Engineering". When "Bill" sent a request, it was from Bill Hewlett, who was also president of IRE (IEEE's predecessor). So Bud Eldon started what become a branch of today's Electronics Packaging Society. Bud went on to be IEEE President in 1985.

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

IEEE Grid
March 1965
SAN FRANCISCO SECTION
INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS

Power in the Space Age

meeting reminder

March 16 (Tuesday) Automatic Control, Engineering Management
March 17 (Wednesday) Santa Clara Valley Subsection, Military Electronics/Reliability
March 18 (Thursday) Biomedical Engineering/Aerospace Information Theory
March 22 (Monday) San Francisco Section/East Bay Subsection
March 23 (Tuesday) Computer, Space Electronics & Telemetry
March 24 (Wednesday) Instrumentation & Measurement
March 25 (Thursday) Audio
March 31 (Wednesday) Communication Technology, Electron Devices
April 6 (Tuesday) Circuit Theory
April 15 (Thursday) East Bay Subsection
April 21 (Wednesday) Nuclear Science
April 22 (Thursday) Circuit Theory

eme and Symbol for the 1965 IEEE Region Six Annual Conference To Be Held in Las Vegas, Nevada, April 13-14-15

OMINEES FOR SECTION OFFICERS, 1965-66 (see page 9)


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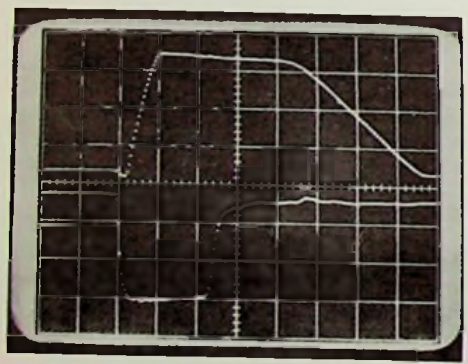

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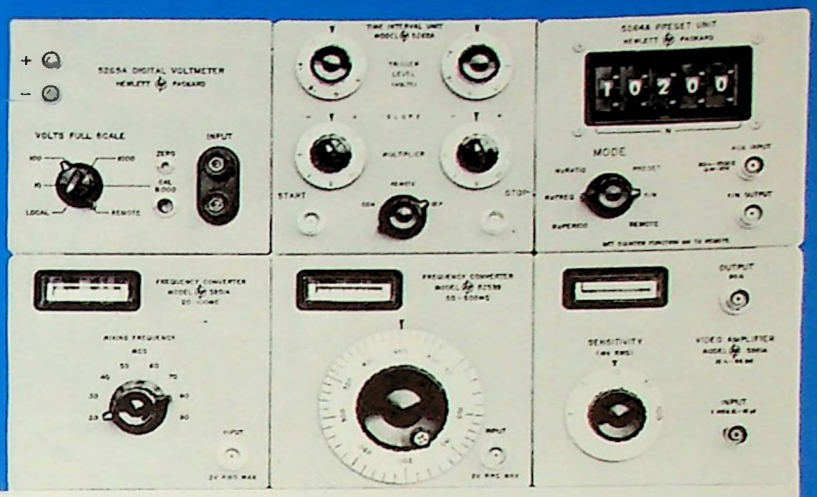

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Or increase the stability of measurements, to 15 gc, with the Hewlett-Packard 2590A Microwave Frequency Converter, $1900, which automatically phase locks an internal transfer oscillator to the signal frequency, providing counter time base accuracy, stability of 5 parts in 10^9 short term or 3 parts in 10^9 per day.

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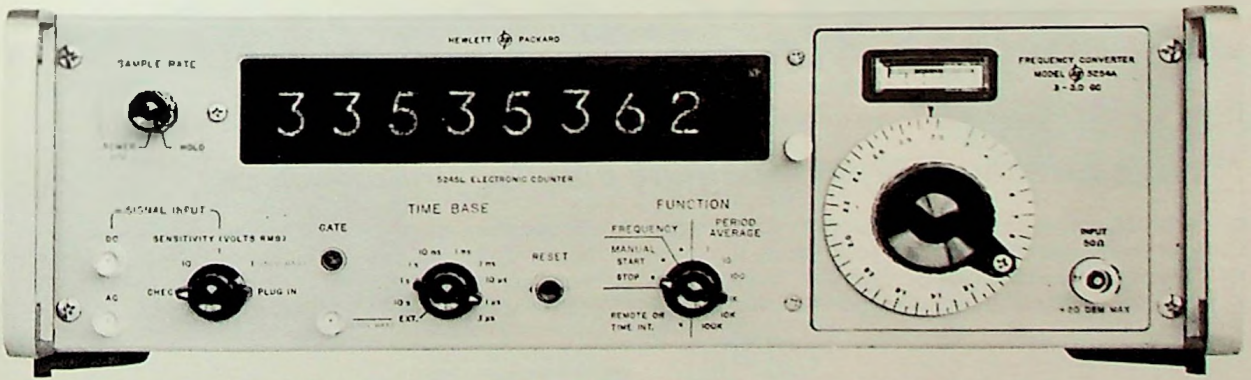

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contents

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advertising

region 6 news

LAS VEGAS CONFERENCE

Some of the nation's most distinguished engineers and scientists will explore the future world of energy conversion and transmission at the 1965 Region Six IEEE Conference in Las Vegas, Nevada, April 13 through 15.

Keyed to the theme, "Power in the Space Age," the conference will draw together top men of the commercial power field and the space power and advanced energy source fields in a series of sessions and panels designed to blueprint the next decade of power and its attendant technical problems.

The conference, hosted by the Las Vegas IEEE Section, will be staged at the mammoth Las Vegas convention center. It will feature special technical tours of Hoover Dam power-generating facilities and the field test site for Project Rover's nuclear reactor rocket.

Conference Chairman Bruce Carder, DASA program manager for Edgerton, Germeshausen and Grier, Inc., said the conference is "truly a meeting for both electronics and electrical engineers."

"We have planned the conference so that it will feature common elements of electronics and electrical engineering. We selected 'Power in the Space Age' as the theme to best represent the two engineering groups."

Carder said the program will have three sessions on the latest in commercial electrical power systems and others on the SNAP nuclear system and other compact power systems.

Sessions will also be devoted to electronic controls, power transmission by microwaves, new electrical power generation devices, and related topics.

One special feature of the conference will be a day-long panel covering the important research areas of electrical energy conversion. Topics will range from thermonuclear power generation to fuel cells and thermonuclear devices.

Advance registration is $3 for IEEE members and $4 for non-members. Student rates are $1 and $2 for members and non-members respectively.

Hotel reservations will close March 25. Conference hotels are the Riviera, Sands, and Sahara. Special student

(Continued on page 8)

cover

The theme, "Power in the Space Age," portrayed in the cover illustration by artist John Mihopulos, symbolizes man's ever-increasing ability to control nature's ultimate source of energy—the energy that drives stars.

meeting ahead

TOMORROW'S TRANSIT

Deane N. Aboudara, electronics and equipment design engineer, San Francisco Bay Area Rapid Transit District, will discuss engineering tomorrow's transit today at a joint meeting of the San Francisco Section and the East Bay Subsection on March 22.

A great synthesis is taking place, combining the experience gained through years of operation of conventional rapid transit with disciplines from other industries, some as far afield as the missile programs. Overall system control by computers, 16,000 RPM traction motors, choppers instead of resistors, and solid-state interlocking are being investigated. New control techniques must be developed for trains traveling as fast as 80 MPH and running 90 seconds apart that can stop within a 12-inch spotting distance.

meeting ahead

YOUNG ENGINEERS

Three speakers from Bay Area companies will form a panel to discuss opportunities the new engineering graduate may find in today's industry at the joint meeting of the Santa Clara Valley Subsection and the student branches of San Jose State, Santa Clara, and Stanford on March 17.

Discussing how young engineers are integrated into industry will be Robert D. Mullikin, senior employment representative of PG&E; Joe Tassi, technical recruiter and manager of fuels manufacturing engineering of General Electric atomic energy division; and Wesley J. Berg, senior education specialist of the engineering education department of IBM.

The meeting will be held at 7:30 p.m. in Room E-132 of the engineering lecture hall, San Jose State College. Parking is available at the garage on Seventh Street between San Carlos and San Salvador.

meeting ahead

RELIABILITY MEASUREMENT

Claude R. Birdsall and A. Dintino of Lockheed Missiles and Space Co. will detail latest attempts in reliability measurement at the March 17 meeting of the Military Electronics chapter.

The customer generally requires reliability estimates during product development and before extensive field use provides reliability demonstration. Advancements in the state of the art are requiring order-of-magnitude increases in guidance, instrumentation, propelling media, etc., thus increasing financial risk. The latest techniques in the application of the theory of probability distributions will be discussed.

MEETING CALENDAR

SAN FRANCISCO SECTION

8:00 P.M. • Monday, March 22

(Joint with East Bay Subsection, see below)

Engineering tomorrow's transit today

Deane N. Aboudara, electronics and equipment design engineer, San Francisco Bay Area Rapid Transit District

Place: Pacific Gas & Electric Co., Oakland Service Center, west of Nimitz Freeway between Hegenberger Road and High Street, 4801 Oakport

Dinner: 5:30 P.M., The Ark, 1111 Embarcadero, Oakland

Information: Jean Helmke, Section Office, 327-6622, by March 15

EAST BAY SUBSECTION

8:00 P.M. • Monday, March 22

(Joint with San Francisco Section, see above)

EAST BAY SUBSECTION

7:30 P.M. • Thursday, April 15

Father and son night

Final selection of high school student paper winners

Dr. Edward Teller

Place: PG&E Service Center, 4081 Oakport, Oakland

SANTA CLARA VALLEY SUBSECTION

7:30 P.M. • Wednesday, March 17

(Joint with Student Branches of San Jose State, Santa Clara and Stanford)

How young engineers are integrated into industry

Robert D. Millikin, senior employment representative of PG&E

Joe Tassi, technical recruiter and manager of fuels manufacturing engineering, GE

Wesley J. Berg, senior education specialist of the engineering education dept., IBM

Place: Room E-132, Engineering Lecture Hall, San Jose State College

GROUP CHAPTERS

Aerospace

8:00 P.M. • Thursday, March 18

(Joint with Biomedical Engineering, see below)

Audio

8:15 P.M. • Thursday, March 25

Recent advances in magnetic recording heads

Nelson Yew, senior engineer, AMPEX

Place: Conference Room B, SRI, 333 Ravenswood Ave., Menlo Park

Dinner: 6:30 P.M., Ramor Oaks, El Camino Real, Atherton

Reservations: 248-3344, Ext. 260, by March 24

Automatic Control

8:00 P.M. • Tuesday, March 16

New data and mathematical models for human operator dynamics

D. T. McRuer, president, Systems Technology, Inc., Inglewood

Place: Engineering Center, Room 551, University of Santa Clara

Dinner: 6:30 P.M., Faculty Club, University of Santa Clara

Reservations: Mrs. McKenna, 296-3360, Ext. 226, by March 15

Biomedical Engineering

8:00 P.M. • Thursday, March 18

(Joint with Aerospace, see above)

Bio test data for manned space flight

Dr. Robert S. Lincoln and Dr. John E. Mangelsdorf, bio-astronautics dept., Lockheed

Place: SRI main conference room, 333 Ravenswood Ave., Menlo Park

Dinner: 6:15 P.M., Red Cottage Restaurant, El Camino Real, Menlo Park

Reservations: Ellen Campbell, 326-6200, Ext. 3372, by March 17

Circuit Theory

8:00 P.M. • Tuesday, April 6

Synthesis of lossless time-varying networks

Dr. David A. Spaulding, U.S. Army

Place: Main conference room, SRI, 333 Ravenswood Ave., Menlo Park

Dinner: 6:00 P.M., Stone Cellar, 1906 El Camino Real, Menlo Park

Reservations: Mrs. Kelley, 326-6200, Ext. 3285, by April 5

MEETING CALENDAR

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 Ave., 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

Communication Technology

7:30 P.M. • Wednesday, March 31

Communications for the State of California
George Rezos, supervising engineer-in-charge, communications, State of California
Place: Pacific Telephone auditorium, 140 New Montgomery St., San Francisco
No host cocktails: 5:30 P.M.
Dinner: (Buffet) 6:00 P.M., Rod's Frontier Restaurant, 30 Kearney, San Francisco; $2.50.
Reservations: Mrs. Kathy Matzen, 399-2009, by 4:00 P.M., March 30

Computer

8:00 P.M. • Tuesday, March 23

The logical and analytical structure of the computer-aided design process as applied to a class of mechanical design problems
Dr. Marvin T. Ling, consultant, GE computer department, Phoenix, Arizona
Place: GE computer lab, 310 De Guigne Drive, Sunnyvale
Dinner: 6:30 P.M., Old Plantation, El Camino and Bernardo, Sunnyvale
No reservations required

Electron Devices

8:00 P.M. • Wednesday, March 31

The metal-oxide-semiconductor triode
Charles A. Bittman, manager, solid state physics department, Fairchild Semiconductor, R&D Lab
Place: PH 101, Stanford University
Dinner: 6:00 P.M., Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto
Reservations: UL 4-3300. Ext. 557, Mrs. Williams, by March 30

Engineering Management

8:00 P.M. • Tuesday, March 16

When do good engineers make good engineering managers?
L. S. Burbank, Burbank Associates, management consultants, San Francisco
Place: Lockheed Auditorium, Bldg. 202, 3251 Hanover St., Palo Alto
Dinner: 6:15 P.M., Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto
Reservations: 326-6200, Ext. 2550, by March 15

Information Theory

8:10 P.M. • Thursday, March 18

Communication nets
L. Kleinrock, assistant professor of engineering, UCLA
Place: Philco auditorium, 3825 Fabian Way, Palo Alto
Dinner: 6:15 P.M., The Brave Bull, El Camino Real, Palo Alto
Reservations: Mrs. D. Saltzman, 326-4350, Ext. 4101, by March 17

Instrumentation & Measurement

8:15 P.M. • Wednesday, March 24

Voltage references, old and new
David Hilbiber, Fairchild Semiconductor, Palo Alto
Place: Fairchild, 4001 Junipero Serra Blvd., Palo Alto
Dinner: 6:15 P.M., L'Omelette, 4170 El Camino Real, Palo Alto
No reservations required

Military Electronics

8:00 P.M. • Wednesday, March 17

(Joint with Reliability, see page 6)
Latest attempts in reliability measurement
Claude R. Birdsall, LMSC, and A. Dintino, LMSC
Place: Lockheed Auditorium, Bldg. 202, 3251 Hanover St., Palo Alto
Dinner: 6:30 P.M., Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto
Reservations: (for dinner only) Ralph W. Franks, 743-2778, by March 16

(Continued on page 6)

meeting ahead

HUMAN OPERATOR DYNAMICS

New data and mathematical models for human operator dynamics will be the subject of D. T. McRuer, president, Systems Technology, Inc., Inglewood, at the March 16 meeting of the Automatic Control chapter.

The dynamic characteristics adopted by human pilots as active elements in manual control systems depend on the control situation (vehicle dynamics, display configuration, and manipulator characteristics), on the command disturbance forcing functions, and on environmental conditions. This paper will briefly summarize representative effects of such factors on typical pilot characteristics. Emphasis will be placed on new data and on newly discovered facets of pilot adaptation in single-loop vehicle control situations.

Duane McRuer is president and a technical director of Systems Technology, Inc. Prior to organizing that company in 1957, he was associated with Control Specialists, Inc., and Northrop Aircraft, Inc. Holding a B.S. in engineering and an M.S. in electrical engineering from the California Institute of Technology, his professional experience includes virtually every aspect of systems engineering at several levels and in all design phases. The major part of these efforts have been particularly concerned with research, design, and development of manual and automatic flight control, navigation, fire control, and guidance equipment for aerospace vehicles. He has written over 60 technical papers and reports on automatic and manual flight control and handling qualities for aerospace vehicles. In 1960, together with E. S. Krendel, he was awarded the Levy Medal of the Franklin Institute for their joint work in the application of system analysis techniques to the study of human dynamic behavior.

meeting ahead

COMMUNICATION NETS

Leonard Kleinrock, assistant professor of engineering, UCLA, will address the March 18 meeting of the Information Theory chapter.

Professor Kleinrock is to consider the stochastic flow of message traffic in connected networks of communication centers. The networks considered are channel capacity limited, and consequently the measure of performance is taken to be the average delay encountered by a message in passing through the net. Questions pertaining to the assignment of channel capacities, effect of priority discipline, choice of routing procedure, and design of topological structure are considered.

MEETING CALENDAR

Nuclear Science

8:00 P.M. • Wednesday, April 21

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

Reliability

8:00 P.M. • Wednesday, March 17

(Joint with Military Electronics, see page 5)

Space Electronics & Telemetry

8:15 P.M. • Tuesday, March 23

Wideband data recording with FM and magnetic tape
Dalton W. Martin, president, Vidar Corp.
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: C. Jamgotchian, 697-7774, by noon, March 23

meeting ahead

GOOD EE MANAGERS

L. S. Burbank, Burbank Associates, San Francisco, will answer the question, "When do good engineers make good engineering managers?" at the March 16 Engineering Management chapter meeting.

It has often been observed that management usually does a relatively good job in evaluating the equipment aspects of a person being considered for hire or advancement—his past experience, education, intellectual capacity, health, etc.—and that management failures or half-failures are more likely to be found in such areas as lack of leadership, indecisiveness, inability to delegate, poor judgment, and inability to get along with others. This meeting will consider methods which are being used to evaluate these elusive latter factors.

The speaker has had extensive experience in consulting with Bay Area firms regarding personnel selection for management positions. His observations should be equally valuable to managers responsible for determining whom to promote, and to engineers interested in guiding their own careers. Topics to be discussed include: the problems of placing a man in a job "over his head"; the "law of diminishing competence"; the problems of supervising a technical group; the value of tests; and evaluation and weighing of personality traits which rarely change after the time a person reaches his working career.

meeting ahead

REFERENCE VOLTAGE SOURCES

David Hilbiber, Fairchild Semiconductor research and development lab, Palo Alto, will discuss the merits and limitations of reference voltage source, old and new, at the March 24 meeting of the Instrumentation and Measurement chapter.

There is no challenger at the present time to take over the role of the Weston saturated cell as the primary standard. Further, if such an element were to be developed, it would have to stand the test of time; that is, a stability better than 10 ppm for 3.5×10^5 hours.

The case for the working reference is not so simple, however. In the past five years or so the avalanche, or zener, diode has shown a performance level that is comparable to the Weston unsaturated cell. Thus, the instrumentation system designer is able to select a source that is the most compatible with his requirements. Among the factors that must be considered are: physical environment such as temperature and shock; long-term stability; noise; output resistance or current capability; temperature coefficient; and cost. These topics will be discussed in detail.

meeting ahead

MAN IN SPACE

The Aerospace and Biomedical chapters will jointly present a timely technical meeting March 18 on the subject of monitoring the physical condition of man in space.

Dr. John E. Mangelsdorf and Dr. Robert S. Lincoln, both with the bioastronautics department at Lockheed, Sunnyvale, have applied much effort toward the objective of developing hardware instrumentation, methodology, and data processing procedures to provide a standardized technique for monitoring man's physical condition and measuring his performance ability during space flight, including a crew monitoring system made possible by recent advances in medical electronics and data processing equipment.

'65 SHOW MARCH 22-26

The 1965 IEEE International Convention will be held from March 22 through 26 at the New York Hilton Hotel and New York Coliseum in New York City. The convention features a 25 percent increase in number of technical papers compared to last year's program; as a result, the technical meetings will be held on five days instead of four as in the past. The exhibits will continue to be open for four days: from Monday, March 22, through Thursday, March 25.

The world's largest technical meeting and exhibition is expected to draw an attendance of about 70,000 engineers and scientists from 40 countries.

An increased technical program consisting of 400 papers, covering breakthroughs in every area of electrical and electronics engineering, will be presented in 80 technical sessions. For the first time in the history of the annual convention, the "Convention Record"—several volumes containing all of the papers presented at the meeting—will be available at the time of registration. Because of the availability of the "Convention Record," no other preprints will be permitted at the technical sessions or elsewhere at the convention.

One high point of the program will be a special evening symposium on Tuesday, March 23, on a subject of major interest. Another will be a talk by Frederick R. Kappel, chairman of the board of AT&T, who will be principal speaker at the annual banquet on Wednesday, March 24, in the grand ballroom of the Hilton. At the banquet, the following major IEEE awards will also be presented: Edison Medal, Lamme Medal, and Education Medal. In addition, the 125 recently elected Fellows will be recognized.

Field awards and prize paper awards will be presented at special ceremonies on Tuesday, March 23.

More than 1,000 exhibitors will display $20 million worth of the latest electrical and electronic equipment, most of it for the first time. The show will be in two locations: the Hilton and the Coliseum. This year, for the first time, the electrical and electronics exhibits will be fully integrated with no attempt made to separate them. For the convenience of visitors, the exhibits at the Coliseum will be grouped as follows: Floors 1 and 2—components and heavy machinery; Floor 3—systems and instruments Floor 4—production. The Hilton will be used for new exhibitors. The Coliseum will be closed on Friday, March 26.

There will be an international hospitality room at the headquarters suite in the Beekman Room at the Hilton hosted by the international reception committee. Its bilingual members will be in attendance to greet visitors from abroad.

There will also be a hospitality suite for IEEE members' wives at the Hilton, where coffee will be served each morning. The women's program includes a welcome tea on Monday afternoon and a gala luncheon and fashion show on Tuesday.

The cocktail party will be held on Monday evening from 5:30 to 7:30 in the grand ballroom of the Hilton.

meeting ahead

WIDEBAND RECORDING

Dalton W. Martin, president, Vidar Corp., Mountain View, will discuss wideband data recording with FM and magnetic tape at the March 23 meeting of the Space Electronics and Telemetry chapter.

There is an increasing need for multichannel wideband data recording. For example, systems are being specified that require several hundred 20-kc channels to be recorded simultaneously. Specific examples of these requirements will be presented. Recording this data with FM on magnetic tape recorders is the only presently available practical and economical way to preserve this data.

After a brief history of magnetic tape recording, the various forms of FM systems will be surveyed. Advantages and disadvantages of each configuration will be discussed. The capabilities of available equipments will be described. Finally, the limitations of the systems will be shown in terms of the system parameters.

meeting ahead

NETWORK SYNTHESIS

Dr. David Spaulding, U.S. Army, will discuss synthesis of lossless time-varying networks at the April 6 meeting of the Circuit Theory chapter. Linear time-varying networks are characterized in terms of their impulse responses. By using the properties of passivity and losslessness, the form of the impulse responses of finite networks is developed. This leads to a lossless synthesis which uses time-varying transformers and time-invariant inductors and capacitors. The one-port case is of principal interest, but the n-port extension is given.

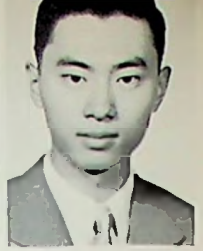
At the April 22 meeting, Dr. T. J. Harrison, IBM, San Jose, will discuss impedance matrix synthesis. A technique for the realization of the impedance matrix of an n-port resistor network, in which all ports have a common node, will be presented. The method utilizes an algorithm developed by Branin in his study of large networks. Certain necessary conditions on a realizable impedance matrix, which are readily verified by inspection, will be stated and variations of the method discussed.

section inputs

CHANGE OF ADDRESS

If you plan to change your address, notify headquarters and the section office at least three weeks in advance of the effective date.

Martin



Yew

meeting ahead

NEW RECORDING HEADS

Nelson Yew, senior engineer, Ampex Corp., Redwood City, will discuss recent advances in magnetic recording heads at the March 25 meeting of the Audio chapter.

Brief background information on the basics of magnetic recording and reproducing heads will be given, including the gap phenomena, head efficiency, thickness loss, and azimuth loss. Common head material characteristics and their effects on head performance will be discussed, including head geometry and its effect on performance.

Signal-to-noise ratios of typical audio and instrumentation systems will be discussed, leading to an introduction to head signal-to-noise performance related to head material and geometry characteristics. Recent developments on wideband heads will be touched on, using the Ampex FR-1400 as an example. Future trends on wideband magnetic recording and reproducing head development will also be discussed.

MORE LAS VEGAS

rates are available at the Thunderbird and the Stardust hotels.

Address reservation requests and checks for advanced registration to Clifford W. Maltby, Registration Chairman, Box 974, Boulder City, Nevada 89005; checks payable to IEEE Region Six Annual Conference.

MORE MOST

vacuum tubes. It may be designed to be conducting or cut-off at zero gate bias. This results in great simplicity in the design of switching circuits. Extremely complex integrated circuits have been produced employing MOSTs. The device has superior properties for use as a chopper and for use as a constant current source.

In his talk, Mr. Bittmann will review the design theory of depletion and enhancement mode MOSTs and compare the predicted performance with that of bi-polar transistors and junction field-effect transistors employing similar tolerances. He will discuss high-frequency operative and switching characteristics.

NOMINATIONS FOR 1965-66

Nominations for section officers for the 1965-66 program year have been announced and will appear on a postcard ballot to be received by the voting membership in May.

CHAIRMAN

Jack L. Melchor, present vice chairman and past secretary and treasurer of the IRE section, a senior member. B.S. and M.S. in physics, University of North Carolina; Ph.D., University of Notre Dame, where he was a Fellow in high polymer physics, research associate,. and instructor; Bendix Aviation Corp.; Sylvania Electronic Defense Laboratories; co-founder and first president of Melabs; director of Melabs, Applied Systems Corp., Astro Technology and -hp associates-. Author of many technical papers and holder of a number of patents; president of -hp associates-.

VICE CHAIRMAN

E. H. Hulse, presently completing the unexpired term of Gerard K. Lewis (resigned) as secretary; present group coordinator; past co-chairman of the Education and Student Relations Committee of the IEEE section and former education chairman of the AIEE section, a senior member. Head, electronics engineering dept., Lawrence Radiation Laboratory, Livermore. B.S., University of California, Berkeley. A registered engineer in California and Utah. Westinghouse, UCLA, USC.

SECRETARY

Fred J. MacKenzie, present treasurer of the section, and former membership chairman of the IRE section; a member. Active in WEMA and WESCON, formerly active in Los Angeles Section. A member of the IEEE Committee on Membership and Transfers and former member of the PTGMIL Administrative Committee. University of Chicago and Technological Institute of Northwestern University. Administrative Engineer, Communication and Radio Physics laboratories, Stanford Research Institute.

TREASURER

There are three nominees for the office of treasurer:

J. E. Barkle, present chairman of the Power chapter, for which he also served as organizer; a senior member. B.S. in EE, Carnegie Institute of Technology, Westinghouse Electric Corp., Loggers and Mill Supply Co. Member, Edison Electric Institute, electrical systems and equipment committee, active in IEEE committee affairs, author of several technical papers on power generation, transmission and system protection, Chief electrical engineer, power and industrial division, Bechtel Corp., San Francisco.

James J. McCann, present secretary-treasurer of the Power chapter, technical program chairman of AIEE San Francisco Section, 1962-63; a senior member. B.E.E. from the University of Santa Clara. Former Lieut., U.S. Navy submarine service. Has served PG&E for 19 years and is now administrative engineer in the office of the vice president for engineering. San Francisco.

E. W. Pappenfus, current chairman, Future Engineers Show, 1965 WESCON, and member, section Fellows Committee; a Fellow. B.S.E.E., University of Minnesota. Collins Radio Co. Past chairman, Cedar Rapids Section; chairman, Cedar Rapids Transistor Symposium; member, national papers review committee and radio communication committee. Author of more than 40 technical papers and co-author of book on single sideband. Vice president, engineering, Granger Associates, Palo Alto.

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ieee news

OLIVER '65 PRESIDENT

Dr. Bernard M. Oliver, vice president of research and development, Hewlett-Packard Co., Palo Alto, has been elected president of the IEEE for 1965, it has been announced by the IEEE board of directors. Dr. Oliver succeeds Clarence H. Linder, retired General Electric vice president, who was IEEE president for 1964.

The IEEE vice presidents for 1965 will be Dr. W. G. Shepherd, professor and head of the electrical engineering department of the University of Minnesota, and Hendley Blackmon, engineering manager, association activities, Westinghouse Electric Corp., Pittsburgh, Pa.

Haraden Pratt, consultant, Pompano Beach, Fla., will continue in 1965 to hold the office of secretary. The treasurer for 1965 will be Seymour Herwald, vice president of Westinghouse Electric Corp., Pittsburgh, Pa. The editor will be Dr. F. Karl Willenbrock, associate dean of engineering and applied physics, Harvard University.

Dr. Oliver, chairman of the San Francisco Section of IRE in 1956, was born in Santa Cruz in 1916. He was graduated from Stanford in 1935 with the A.B. degree in electrical engineering. The following year he received the M.S. degree in electrical engineering from California Institute of Technology. He then spent a year in Germany as an exchange student under the auspices of the Institute of International Education. In 1940 he received the Ph.D. degree, magna cum laude, in electrical engineering from Cal Tech.

As a member of the technical staff of the Bell Telephone Laboratories, New York, N.Y., from 1940 to 1952, he worked on the development of automatic tracking radar, television, information theory, and efficient coding systems. In 1952 he joined Hewlett-Packard as director of research and in 1957 was appointed vice president of research and development.

Dr. Oliver holds over 40 U.S. patents in the field of electronics. He is highly active in both industry and professional affairs. He was elected Fellow of the IRE in 1954 and director-at-large of that organization in 1958. He served on the board of directors of WESCON. Following the merger of IRE and the AIEE, Dr. Oliver was elected vice president of the newly-formed IEEE for 1963 and 1964.

Oliver *Angwin*

region 6 news

ANGWIN RE-ELECTED

Bruce S. Angwin, General Electric Company, has been elected to a full two-year term as Region Six Director. His territory includes the eleven Western states, and embraces a membership of some 30,000 engineers and student-engineers.

Angwin is manager, Western Region, receiving tube department, General Electric Company. He joined GE after receiving his B.S.E.E. from the University of California.

He has been very active in the IEEE, holding numerous Los Angeles Section positions. In addition, he served eight years on the board of the Western Electronic Show and Convention. Other memberships include the Society of Television Engineers, Los Angeles Technical Societies Council, SMPTE, National Academy of Television Arts and Sciences, Hollywood Museum Associates, and participation in the Los Angeles Science Center and Boy Scouts of America.

MORE SECTION NOMINATIONS

SECTION/WESCON DIRECTOR

John C. Beckett, present chairman and past vice chairman of the IEEE section, and past chairman of the AIEE section; a Fellow. A.B. in electrical engineering, Stanford (magna cum laude); E.E., Stanford; registered in electrical engineering in California, Oregon, Nevada; Westinghouse Electric Mfg. Co., U.S. Navy; S.F. Bay Area Rapid Transit District; Wesix Electric Heater Co.; numerous offices and committees of AIEE, including chairman, Pacific Energy Conversion Conference; Hewlett-Packard Co., Palo Alto.

Section bylaws provide that "additional nominations by petition may be submitted no later than April 1 to the section executive committee for inclusion on the ballot. To be valid, such petitions shall carry the signatures of no fewer than 25 voting members of the section and include a statement of the willingness of the candidate to serve. Election shall be by mail ballot and shall be completed by May 15. The incoming officers shall assume the duties on or before July 1 on a date fixed by the outgoing executive committee."

Rezos

Bittman

meeting ahead

STATE COMMUNICATIONS

George Rezos, supervising engineer-in-charge, communications, State of California, will discuss the State's communications at the March 31 meeting of the Communications Technology chapter.

The talk will cover the very large private line telephone network required for "administrative" traffic, the teletype network of the Department of Justice, the many mobile radio systems to serve the vehicles of the highway patrol, and systems for the Division of Forestry for fighting forest fires, the Highway Department for snow removal and other maintenance, the California Disaster Office, and many other agencies. Also discussed will be the statewide microwave system for interconnecting widely scattered agency offices.

meeting ahead

THE MOST

The metal-oxide-semiconductor-triode (MOST), or the insulated-gate field-effect transistor, as it is variously called, will be reviewed by Charles A. Bittman, Fairchild Semiconductor, Inc., Palo Alto, at the March 31 meeting of the Electron Devices chapter.

MOST was one of the earliest proposed semiconductor amplifying devices. Work at Bell Laboratories in 1948 on germanium surfaces, aimed at explaining the poorer-than-expected performance of field-effect devices, resulted in the invention of the bi-polar transistor. However, only recently has the technology for SiO_2 passivated silicon surfaces progressed to the point that high performance devices having good stability of electrical properties have been achieved. (In MOST, the electric field under the gate is often several million volts/cm, a condition much more severe than encountered in planar transistors.)

MOST is a very high input impedance device, surpassing even the best electrometer tubes in this characteristic. It may have transconductances of the same range as modern

(Please turn to page 8)

meeting review

LUEBKE ON KLYSTRONS

The first meeting of PTGED and PTGMTT was held jointly at Stanford University on Wednesday, October 21. About 23 members attended.

Chairman Dick Borghi, of SLAC, announced the new officers: vice-chairman, Dr. William Waters (Microwave Electronics Corp.); secretary, Dr. Richard Soshea (HP Associates); and treasurer, Dr. Daniel Dow (Varian Associates).

He then introduced the speaker, William Luebke, of Eitel-McCullough, who reported on the development of an x-band megawatt CW klystron. The tube uses extended interaction cavities, which in this case are short-circuited sections of TWT slow-wave circuits. Extended interaction cavities are used because of their large surface area (and therefore high power handling capability) and high $\frac{R}{Q}$

Four phases of the design and evaluation were described: evaluation of the electron gun in a beam analyzer, evaluation of the electron optics in a diode, evaluation of the extended interaction cavities in short-pulse tubes, and evaluation of high average power performance in long-pulse tubes.

The beam analyzer was built to permit examination of the beam under the same focusing system as would be used in the actual operating tube. The analyzer used an oil-free vacuum system, with molecular sieve roughing pumps and an ion-sputtering high-vacuum pump, and crushed-copper vacuum seals. Evaluation was done at 20 kv. The beam was scallop-free, with its skirts well within the drift tube. The shape of the magnetic field at the cathode was found to be critical. Hum caused so much deflection of the beam that the modulators had to be synchronized with the AC line frequency.

The diode collector was built first, in several sections of impressive size: 19 inches inside diameter, 65-inch-long cylindrical region, and 1-inch-thick copper walls, with stiffener rings like those of a submarine shell. The end cone was specially built to permit 75 GPM of water flow for cooling. All sections were electrically connected together, and measurements were made calorimetrically. The beam was found not to spread as rapidly in the collector as had been expected, so that the first part of the cylindrical region received no beam current at all, and the end cone received more than had been expected (400 kw a 1 Mw input, or about 1 kw per square inch).

The pulsed tube used four cartwheel backward-wave interaction sections, operating in the π-mode, each with an $\frac{R}{Q}$ of 50, to provide a total $\frac{R}{Q}$ of 200. The efficiency was .55 at the design voltage of 150 kv, with a maximum efficiency of .61 at 170 kv. Maximum power obtained was 2 Mw. No instability was found at any voltage or drive level. The wave guide terminal was not on the end cavity of the extended interaction circuit, as some modes have no fields in the end cavities, and also coupling to the end cavity could lead to instability.

The long-pulse tubes used single

(Continued on page 16)

grid swings

IT IS REPORTED:

Peter Manolakos has been appointed district manager of the northern California territory for Amelco Semiconductor, division of Teledyne, Inc.

Charles R. Pincsak has joined Sylvania Electronic Systems, a division of Sylvania Electric Products, Inc., as controller of its western operation.

Richard Laufenberg has been selected outstanding student at the IEEE student branch at San Francisco State College, according to Rene B. Marxheimer, associate professor, engineering department, and branch counselor.

Jorgen P. Vinding has entered business as a consultant in microwave techniques, communications, and instrumentation, with offices at 18780 Withey Road, Monte Sereno (EL 4-9150).

Charles M. Volkland has been appointed director of marketing for the Sierra Electronic Division of Philco Corp.

Herbert J. Scott, having completed 30 years of service with the University of California at Berkeley, has retired as professor of electrical engineering and assistant dean of the College of Engineering and joined the ranks of the professors emeriti.

Sylvania Electric Products, Inc., a GT&E subsidiary, has been awarded a $7.4 million USAF contract for production and delivery of advance airborne data-processing equipment for incorporation into larger electronic systems.

Frank Schulenberg has been named national field sales manager of Secode Corporation, San Francisco. **Lew Best** was promoted to manager, marketing services.

John H. Cotter has joined the R&D engineering staff of the Cascade research division of Huggins Laboratories, Sunnyvale, and will conduct special projects in advanced ferrite studies.

Perrott Associates has been named manufacturer's representative for Siliconix, Inc., Sunnyvale, to cover Alabama, Georgia, and Florida.

Eric D. Daniel has been named director of research at Memorex Corp., Santa Clara manufacturer of precision magnetic tapes, having served as associate technical director since 1961.

Frank F. Farran has joined the Pelmec division of Quantic Industries, Inc., San Carlos manufacturer of missile and aerospace ordnance devices. He was formerly manager of manufacturing at Advanced Technology Laboratories, Mountain View.

Fred D. Kochendorfer has been appointed manager of advanced systems and programs for Philco's WDL division with responsibilities including the planning and conceptual design of advanced space vehicle systems.

Dr. Se Puan Yu has been appointed a senior scientist of the electron tube division research laboratory, Litton Industries division, San Carlos, and will be responsible for basic research programs including new methods of microwave generation.

R. H. Wold will serve as direct factory representative in the northern California area for Dressen-Barnes Electronics Corp., manufacturers of DC power supplies.

William E. Budd, Archie D. Marez, and **Andre Lubarsky, Jr.,** have been added to the technical staff of Watkins-Johnson Co., Palo Alto.

Thomas K. Wood has been appointed controller for Moxon Electronics Corp., one of the largest electronic instrumentation and systems sales engineering firms in the western U.S.

W. Philip Schirm, Jr., has been named manager of quality and reliability assurance by Siliconix Incorporated, Sunnyvale, and will be responsible for reliability improvement, QRA engineering, process and testing surveillance, and development and control of all quality and reliability procedures of SI's unipolar field-effect transistors and integrated circuits.

Eitel-McCullough, Inc., San Carlos, has been awarded a $215,000 contract by Energy Systems, Inc., Palo Alto, to build 20 high-power klystrons for transmitters in the new NASA unified s-band network, the worldwide communications system supporting the Apollo lunar spacecraft programs.

cal extension news

NEW INDUSTRY SEMINAR

A seminar on creation of new industry and new business enterprise will be held in San Francisco Thursday through Saturday, May 6-8. The meeting is sponsored by Engineering Extension, University of California, Berkeley.

The seminar is aimed at outlining for engineers and executives of industrial concerns (1) how technological change can be converted into new areas of industry and (2) how these new areas can be made the basis of new lines of business and new business enterprise.

The three-day meeting is intended for engineers and managers in all industrial fields, particularly those that have been affected by the cutback in defense spending and are seeking new business opportunities in the peacetime economy.

The basic concept of the seminar is that the conversion of technological advances to industrial and business use is not an automatic process but is the result of purposeful effort employing the right kind of technical, industrial, and business know-how. Intensive lecture and discussion sessions will be devoted to presenting an analysis of methods that can be used to exploit technological advances for the creation of new industrial and business enterprise.

Three self-contained but related one-day programs are scheduled. The sessions on Thursday, May 6, will concentrate on technological advances suitable for conversion to new industry, that are available from government research and development programs. Friday will be devoted to a parallel survey of technical advances stemming from R&D programs carried out by private industry. The final day, Saturday, will present the know-how for converting technical advances into new lines of business and new business enterprises.

The morning session of each day's program will feature three talks by authorities with long experience in their subject areas. Afternoons will be reserved for discussions among the speakers and audience so as to permit problems of special interest to be thoroughly aired.

Speakers at the Thursday morning sessions on new industry opportunities created by government R&D will cover the fields of atomic energy (AEC), space (NASA), and weapons (Department of Defense). Friday discussions will take up three major areas of private research: the chemical industry, the electronics industry, and general manufacturing as exemplified by the automotive industry.

The Saturday session on converting technical advances into new lines of business activity will feature talks on (1) the "biology"—growth and reproduction patterns—of new industry resulting from technological change; (2) government aids to the formation of new lines of technical business and new business enterprise; and (3) know-how for starting and developing a new line of technical business or a new business enterprise.

The roster of speakers includes Fred Payne, deputy director (strategic and defense systems), defense research and engineering, Department of Defense; J. E. Goldman, director, science laboratory, Ford Motor Company; and Donald Schon, director, institute for applied technology, National Bureau of Standards.

Registration for the three-day program is $85. The seminar will meet at the University of California Extension Center, 55 Laguna Street, San Francisco. The Center is close to the downtown area and affords ample parking space.

Further information is available from Engineering Extension, University of California, Berkeley, California 94720; telephone 845-6000, ext. 4151.

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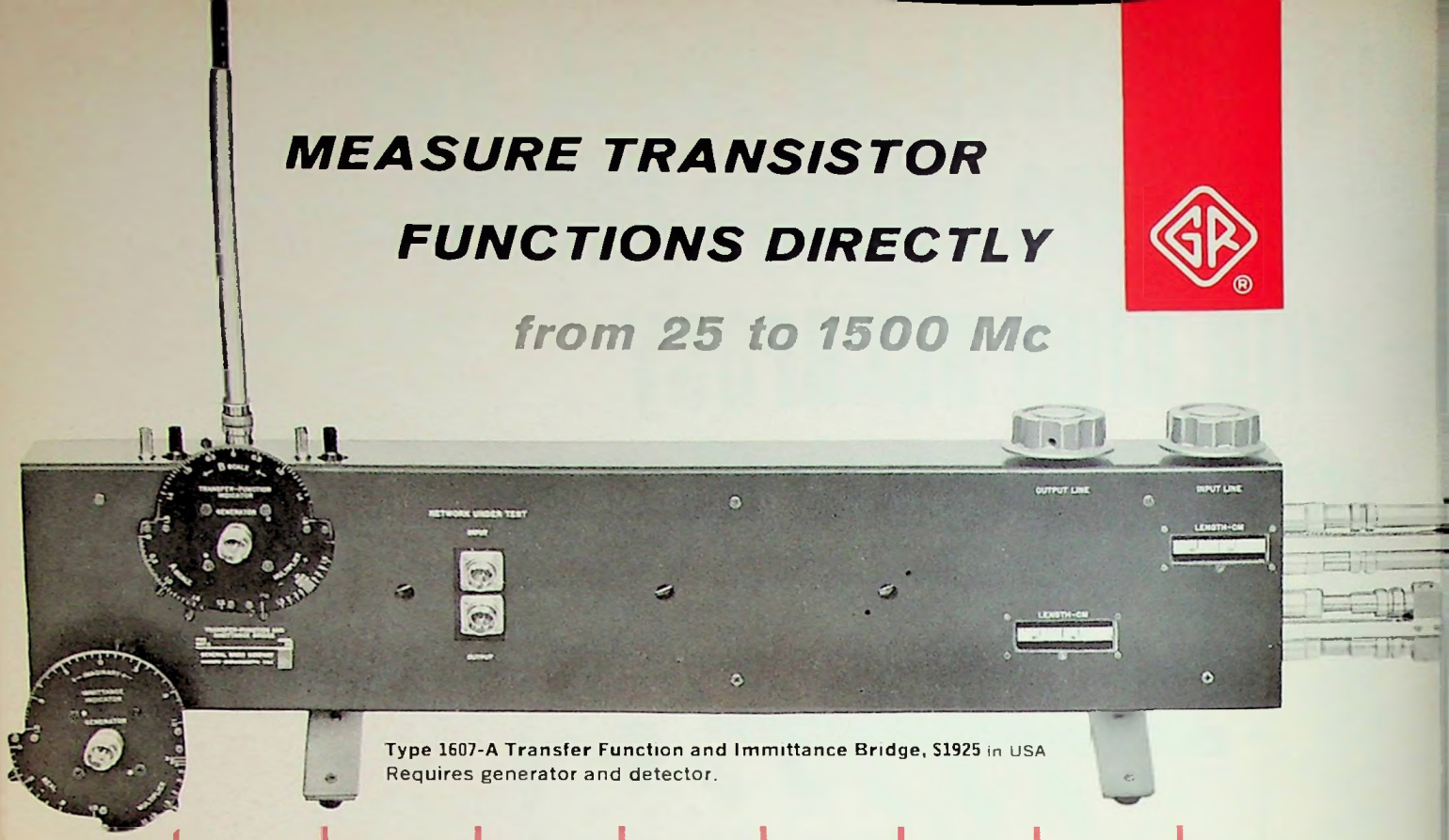

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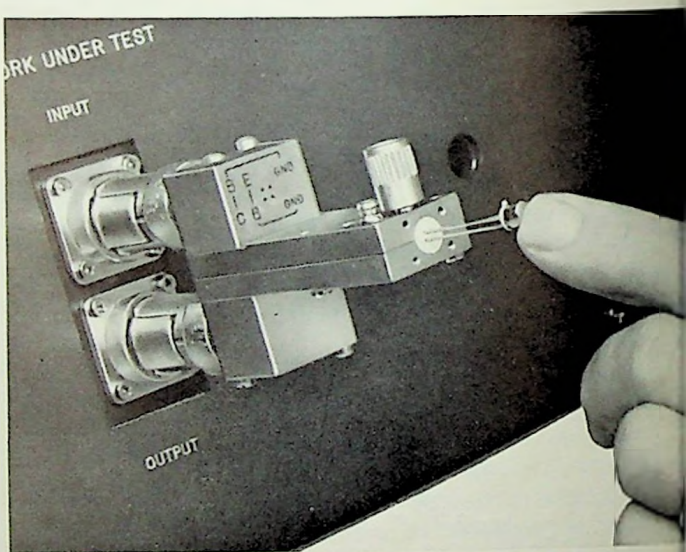

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