EDITOR'S PROFILE of this issue

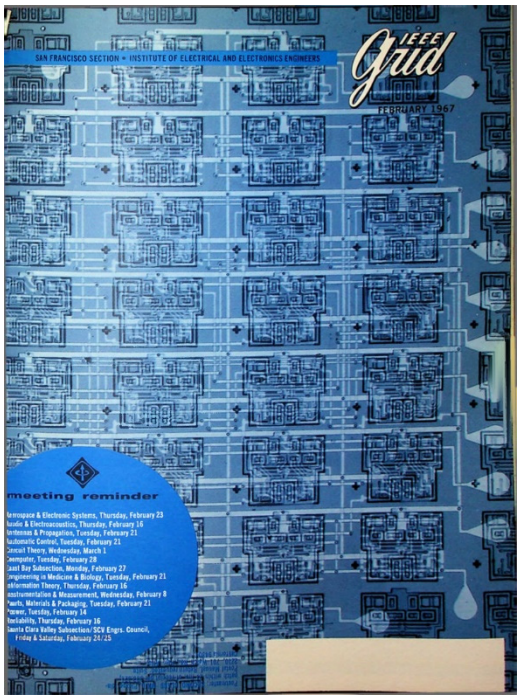
from a historical perspective …

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

February, 1967:

Cover: Shown is an example of Large Scale Integration (LSI).

Page 7: Although the Silicon Valley Engineering Council (SVEC) officially started in 1988, we have evidence of a predecessor (the Santa Clara Valley Engineers Council) back in 1967. During Engineers Week, the SCVEC put on a 2-day seminar ($2 per day, or $3 for both days) on Electric Autos, and a dinner ($4.25). Back then, SJSU was "San Jose State College" ….



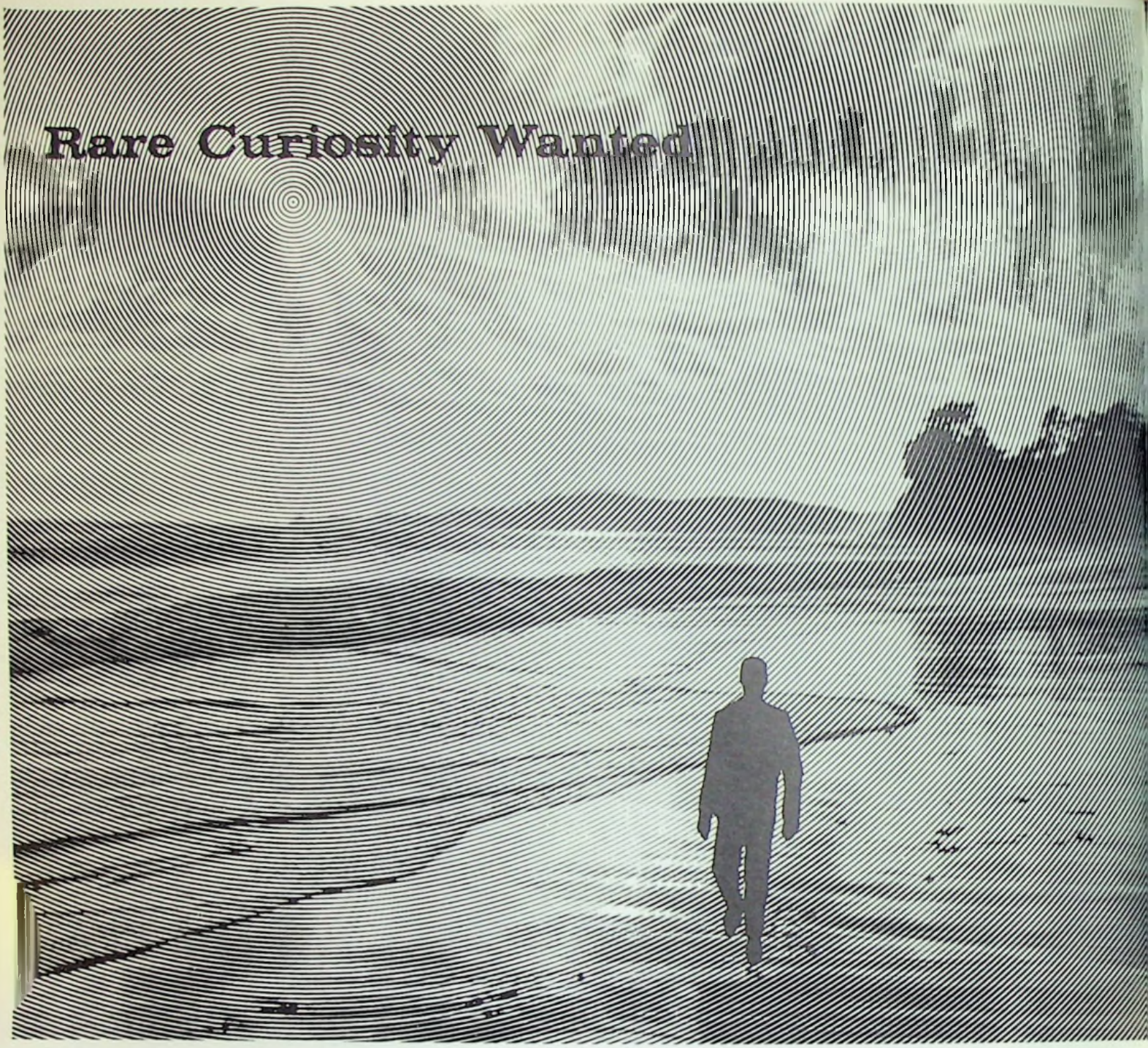
SAN FRANCISCO SECTION • INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS

IEEE Grid

FEBRUARY 1967

meeting reminder

Aerospace & Electronic Systems, Thursday, February 23
Audio & Electroacoustics, Thursday, February 16
Antennas & Propagation, Tuesday, February 21
Automatic Control, Tuesday, February 21
Circuit Theory, Wednesday, March 1
Computer, Tuesday, February 28
East Bay Subsection, Monday, February 27
Engineering in Medicine & Biology, Tuesday, February 21
Information Theory, Thursday, February 16
Instrumentation & Measurement, Wednesday, February 8
Parts, Materials & Packaging, Tuesday, February 21
Power, Tuesday, February 14
Reliability, Thursday, February 16
Santa Clara Valley Subsection/SCV Engrs. Council, Friday & Saturday, February 24/25



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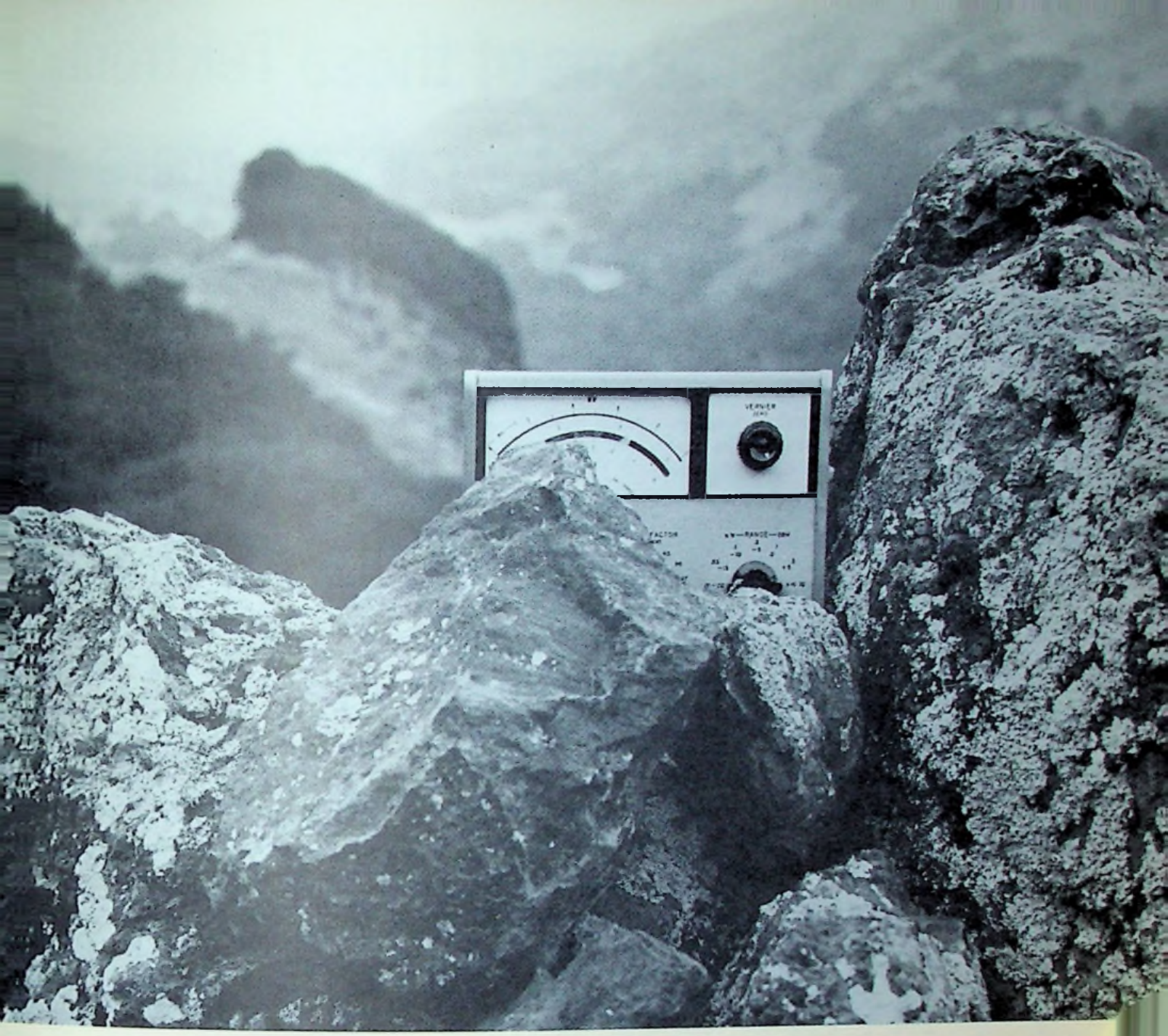

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contents

san francisco section officers

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advertising

the section

MEMBERSHIP

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

M.A. Arbib
J.J. Beer
A.B. Bergh
H.M. Blume, Jr.
M.J. Bondi
E.R. Carlisle
P.L. Carter
H.S. Crafts
E.R. Crossman
E. Ekonomi
P.A. Fialer
J.R. Flexer
D.F. Hall
O. Hatcher, Jr.
K. Hidaka
W.J. Hill
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D.C. Jones
B. Lindberg
R.C. Lucas
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W.V. Mansfield
S.Y. Matsuo
J.A. Mohlman
H.J. Mullery
K. Nishimura
L.K. Russell
H.F. Schmid
R.J. Scott
A.G. Seymour
A. Tom
A.C.M. Wang
L.L. Webb
C. Welch
F.S. Wiedmer
D.B. Wood
J.W. Jones

HELP THE SECTION GROW
BRING IN A NEW MEMBER

meeting ahead

ANNUAL PIONEERS' NIGHT

Pioneers' Night, 1967, will be observed by a joint meeting of the San Francisco Section and Santa Clara Valley Subsection on April 7th at the student center of Foothill College, Los Altos Hills.

Members, their families and guests are cordially invited to be the guests of the Perham Foundation and Foothill College at a no-host dinner to be followed by an illustrated review of the Foothill Electronics Museum project, a special planetarium show, and tours of the OSCAR project and the new Foothill observatory. Reserve this date on your calendar and watch for more details in the GRID next month.

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

cover

Illustrated is an example of "large scale integration," the term for high complexity monolithic integrated circuits, containing several hundred transistors and resistors in an area about 0.1 inch square. The February Computer chapter meeting will consider the engineering problems and use of computer aids in the design of such complex components.

meeting ahead

SLAC INSTRUMENTATION

At the February 8th meeting of the Instrumentation & Measurements chapter, Dr. Kenneth B. Mallory, head of the instrumentation and control group at SLAC, will use the beam guidance system as a focus to discuss instruments, data-handling equipment and timing and display systems for the accelerator.

Dr. Mallory has been on the accelerator staff since its conception as "Project M". For the past 20 years he has been at Stanford working with accelerators and other microwave projects.

meeting ahead

SLAC FIELD TRIP

The February 14th meeting of the San Francisco Section Power chapter will be highlighted by a field trip to the linear accelerator center at Stanford University. The program will include discussion on the design, operation, and usage of this unique electron accelerator.

The Stanford Linear Accelerator, first energized over its two mile length in May, 1966, has been operating since December 1966 at 95% of its full capacity of 20 Bev (billion electron volts). Interest from the scientific research field has created a long backlog of particle physics research experiments on the SLAC calendar. An interesting sidelight is that its 220 KV supply is one of the area's largest power services.

meeting ahead

BIO-POTENTIAL ELECTRODES

Dr. Pierre van Rysselberghe of Stanford University and Prof. Raymond Kado of UCLA will discuss electrodes—theory and practice of bio-potential measurement—at the February 21 meeting of the Engineering in Medicine & Biology chapter.

The meeting will concentrate on the basic phenomena associated with metal-electrolyte and metal/metal salt electrolyte systems. Prof. Kado will present experimental data on noise, stability, and impedance of representative types from the various classes of electrodes useful for potential measurements. Dr. van Rysselberghe will then discuss the electrochemical processes underlying these phenomena.

Dr. van Rysselberghe is chairman of the commission on electrochemistry of the International Union for Pure and Applied Chemistry and lecturer in chemistry and chemical engineering at

(Continued on page 8)

Meeting Calendar

FEBRUARY 8, WEDNESDAY, 8:00 PM — Instrumentation & Measurement

Instrumentation at SLAC

Dr. Ken Mallory, SLAC

Place: Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto
Dinner: 6:30 PM — Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto
No reservations required

FEBRUARY 14, TUESDAY, 7:30 PM — Power

Stanford Linear Accelerator — Field Trip

Place: SLAC, 3101 Sand Hill Road, Menlo Park
Dinner: 6:15 PM, Old Stanford Barn International, 700 Welch Rd., Palo Alto (just west of Stanford Shopping Center)
Reservations: Ted Bubb, 761-1360 by noon Feb. 13

FEBRUARY 16, THURSDAY, 8:00 PM — Audio & Electroacoustics

Modern studio techniques for multi-channel stereo recording

Leo Kulka, president, Golden State Records

Place: Golden State Records, 665 Harrison St., San Francisco
No dinner

FEBRUARY 16, THURSDAY, 8:30 PM — Information Theory

Distinguishable families of distributions

Herbert Robbins, professor of mathematical statistics, Columbia University

Place: SRI Bldg. I, Conf. Room B, Menlo Park
Dinner: 6:30 PM at L'Auberge, 2826 El Camino, Redwood City
Reservations: Mrs. Deane Salzman, 326-4350 Ext. 4101 by Feb. 15

FEBRUARY 16, THURSDAY, 6:30 PM — Reliability

Ladies night — tour of United Airlines Maintenance Center & Flight Kitchen

Bill M. Hecht, United Air Lines

Place: United Airlines Maintenance Base Lobby — take Bayshore Freeway exit east at San Bruno overpass to airport shops. Continue east to UAL visitor's parking lot. Guards will direct you to UAL Mtnce lobby.
Dinner: 6:30 PM same place: $1.75 per plate (flight meal of the day)
Reservations: Mrs. Virginia Thompson, 591-1414 Ext. 345 by Feb. 13

FEBRUARY 21, TUESDAY, 8:00 PM — Antennas & Propagation

Antenna propagation

Dr. Glenn H. Keitel, Dean of EE Dept., San Jose State College

Place: Lockheed Auditorium, Bldg. 202, 3821 Hanover St., Palo Alto
Dinner: 6:00 PM — Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto
Reservations: W. K. Chang, 591-1414 Ext. 223 by Feb. 20

FEBRUARY 21, TUESDAY, 8:00 PM — Automatic Control

Modern control theory and engineering education — panel discussion follows

Dr. Richard C. Dorf, head, Dept. of Electrical Engineering, University of Santa Clara; panelists to be selected from industry

Place: University of Santa Clara, Engineering Center, Room 551
Dinner: 6:30 PM Lucca's, Santa Clara (across from the University)
No reservations required

NOMINATIONS FOR 1967-68 PROGRAM YEAR ANNOUNCED BY SECTION COMMITTEE

Nominations for section officers for the 1967-68 program year have been announced and will appear on a post-card ballot to be received by the voting membership in May.

CHAIRMAN
Fred J. MacKenzie

Fred J. MacKenzie, present vice-chairman and program chairman and former secretary and treasurer of the section, former membership chairman of the IRE section; a member. Active in WEMA and Wescon, Los Angeles Section operating & finance committee, 1959-60. A member of the IEEE committee on membership and transfers and former member of the PTGMIL administrative committee. University of Chicago and Northwestern University infra-red communications lab, 1947-49. Consolidated Electrodynamics Corp., Cal Tech Synchrotron Lab. Administrative engineer, communication and radio physics laboratories, Stanford Research Institute.

There are two nominees for the office of treasurer:

TREASURER
Burton J. McMurtry

Burton J. McMurtry, head optics dept., EDL, Sylvania Electronic Systems, Mountain View. Dr. McMurtry received the B.A. (1956) and B.S. (1957) in Electrical Engineering from Rice University; the M.S. (1959) and the Ph.D. (1962) in Electrical Engineering from Stanford University. He joined the Sylvania Microwave Tube Laboratory, Mountain View, in 1957 and participated in the Honors Cooperative Program with Stanford University from 1957 to 1961. From 1957 to 1959 he was engaged in the theoretical analysis

(continued on page 18)

VICE-CHAIRMAN
J. E. Barkle

J. E. Barkle, present secretary and former treasurer of the section, former chairman of the Power chapter, for which he also served as organizer; a senior member. Present chairman, professional education committee. 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.

TREASURER
Donald O. Pederson

Donald O. Pederson, dept. of electrical engineering, University of California, Berkeley, received the B.S. degree from North Dakota Agriculture College, Fargo, N.D., in 1948, and the M.S. and Ph.D. degrees in electrical engineering from Stanford University, in 1949 and 1951, respectively. From 1951 to 1953, he was a research associate at the electronics research laboratory, Stanford, and, from 1953 to 1955, he was a member of the technical staff at Bell Telephone Laboratories, Murray Hill, N.J. Since 1955, he has been a faculty member of the dept. of

(continued on page 18)

SECRETARY
John B. Damonte

John B. Damonte, present section treasurer, present chairman and former vice-chairman of the membership committee, former chairman of the Antennas & Propagation chapter, a senior member. Manager, microwave engineering dept., Dalmo Victor Co., Belmont since 1958, formerly assistant director of research, supervisor of microwave section, research lab, and research microwave engineer. LMSC since 1966. University of California, 1948-50 as research engineer and teaching assistant. B.S. and M.S., UC. Author and co-author of numerous papers in the antenna and microwave fields.

There is one nominee for the office of Section/WESCON Director:

SECTION/WESCON DIRECTOR
E. W. Pappenfus

E. W. Pappenfus, vice-president, engineering and manufacturing, Granger Associates, Palo Alto. Held various offices, including section chairman, in Cedar Rapids Section, IEEE. Chairman, Cedar Rapids communications symposium, Member, papers review committee—3 years, Fellow in IEEE. Chairman, Future Engineers Show committee, 1965 WESCON. Member, communications systems disciplines committee, IEEE. Member, radio com-

(continued on page 18)

meeting ahead

CONTROL THEORY

Modern control theory is challenging the role of classical control analysis and design. A conference on the place of this theory in the education of undergraduate and graduate engineers was held at the University of Santa Clara during August 1966, sponsored by the National Science Foundation, with 35 college professors in attendance. Professor Richard Dorf, who directed this conference, will report on some of its results at the February 21 meeting of the Automatic Control chapter. One of the questions which will be discussed by Dr. Dorf and a panel of engineers from industry will be the applicability of the time-domain and state-space methods compared to the more classical frequency domain methods.

Richard C. Dorf is chairman of the department of electrical engineering at the University of Santa Clara. Prior to accepting his present appointment, he taught at Clarkson College and the University of Edinburgh, Scotland, as well as at the U.S. Naval Postgraduate School, where he received the Ph.D. degree. Dr. Dorf has been active as a consultant to Sylvania-EDL West, Advanced Technology Labs., Philco, Mobility Systems, Inc., and the Southwestern Research Institute.

meeting ahead

EBSS ON PG&E SYSTEM

A panel discussion of the PG&E 500 KV system will be the subject of the February 27 meeting of the East Bay Subsection at 7:30 p.m. in the PG&E service center at 4801 Oakport Street, Oakland.

PG&E staff members taking part will be T. R. Ferry, supervisor, communications engineering; M. A. Kirsch, manager, line construction; E. G. Lambert, supervising electrical engineer, transmission; H. J. Stefanetti, manager, transmission & distribution, operating; and J. N. Yllaraz, supervising substation engineer, operating.

Each of the panel members will present an approximate 15 minute delivery covering their phase of this tremendous and totally new project. Their discussion will include some of the major problems that have arisen during the development and construction program along with solutions.

The audience will derive an excellent overall picture of line design, construction, operation and maintenance, as well as substation and communication facilities.

The panel presentation will be fol-

(Continued on page 8)

FEBRUARY 21, TUESDAY, 8:00 PM — Engineering in Medicine & Biology

Electrodes: theory and practice of bio-potential measurement

Pierre van Rysselberghe, chairman, Commission on Electro Chemistry, IUPAC, Stanford

Raymond Kado, senior engineer, Brain Research Institute, UCLA

Place: Room M112, Stanford Medical Center

Dinner: 6:15 PM Red Cottage, El Camino, Atherton

Reservations: Noel Thompson, 326-8120 by noon Feb. 20

FEBRUARY 21, TUESDAY, 8:00 PM — Parts, Materials & Packaging

Electronic packaging of ground digital systems

Robert Snyder, supervisor, product design, Philco-Ford WDL

Place: Cafeteria/library, Bldg. 56, Philco, 3825 Fabian Way, Palo Alto

No dinner

FEBRUARY 23, THURSDAY, 6:15 PM — Aerospace & Electronic Systems

Field trip and plant tour of United Airlines Facility

Place: United Airlines Engineering & Maintenance base; take Airport Shops turnoff from Bayshore, about one mile north of SF Airport turnoff.

Dinner is mandatory: 6:15 PM, UAL plant cafeteria — $2.00 per person

Reservations: R. Franks, 743-0525 by Feb. 17

FEBRUARY 24/25, FRIDAY/SATURDAY, 9 AM to 5 PM — Santa Clara Valley Subsection/Santa Clara Valley Engineer's Council, in conjunction with School of Engineering at San Jose State College

Electric automobile symposium

See story for details

Place: San Jose State College — School of Engineering

Social hour on Saturday from 5:30 to 7 PM, followed by Banquet at 7:00 PM

Reservations: for social hour and banquet, and for information on registration: Hugh Ross (408) 253-1572 in Santa Clara area; Harrel Creasey, 969-9411 in Palo Alto/Mt. View area or Don Scollen, 982-8338 in San Francisco area.

FEBRUARY 27, MONDAY, 7:30 PM — East Bay Subsection

Panel discussion on PG&E's 500 KV system

T. R. Ferry, supervisor communication engineering; M. A. Kirsch, manager, line construction; E. G. Lambert, supervising electrical engineer, transmission; H. J. Stefanetti, manager transmission and distribution-operating; J. M. Yllaraz, supervising substation engineer-operating, all of PG&E Co.

Place: PG&E Service Center, 4801 Oakport St., Oakland

No dinner

FEBRUARY 28, TUESDAY, 8:00 PM — Computer

Engineering of large scale arrays and computer aids

Dr. Hugh Mays, Fairchild Semiconductor; Dr. Richard Petriz, Texas Instruments Inc.; Moderator: Dr. Peter Meyers, Magnavox Research Lab.

Place: Room 134, McCullough Bldg., Stanford University

Dinner: 6:15 PM, Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto steak dinner $3.85

Reservations: Mrs. Chris Jensen, 324-3311 Ext. 45034 by noon Feb. 21

MARCH 1, WEDNESDAY, 8 PM — Circuit Theory

Panel discussion: "Comparisons of new methods of active RC Circuit design"

W. Howard (integrated feedback amplifiers), University of Calif., Berkeley; W. Kerwin (RC operational amplifier configuration), Ames Research Center; H. J. Orchard (RC gyrator configuration), Lenkurt Electric; Moderator: R. Newcomb, Stanford University

Place: Room 134 McCullough Bldg., Stanford University

Dinner: 6:00 PM, Red Cottage, El Camino, Atherton

Reservations: Molly Stanley, 739-7700 by Feb. 28

electric auto symposium

GET A HORSE?

The electric auto is back despite the powerful forces that have ridiculed the subject and camouflaged its virtues. The ground swell of technological advancement could not be suppressed indefinitely. The analysis of efficient power utilization in the field of the private car has taken on the aspect of a crash program within the last year. The public is aroused and the government has become aware that America is ready for the next generation of locomotion. With the concentrated effort of industry and government, the assault has at last started on the major problem in the development of the electric car, and energy source unit, (the battery or fuel cell).

How does this development compare with what we have today?

There is no basis for comparison yet. We are on the verge of the engineering breakthrough which will make possible the prototype that you can compare to today's cars.

Many writers have erroneously made comparisons between the limited range of the 'electric' vs. the gasoline powered vehicle. This brings to mind a similar comparison made 63 years ago. At that time it was said that a horse was a far superior form of transportation than an airplane.

You see, a horse on one tank full of hay could run all day and the airplane was lucky to fly one mile at great cost and risk to the pilot!

If we review the major scientific and technological advancements which have taken man into space in six years, is it too hard to imagine these same scientific and technical forces solving the one problem limiting the electric auto: an improved energy source?

Why do we need one?

Now that most people have been convinced that the family car is the worse offender in polluting our environment, we are offered the solution "put a gas mask on your car or yourself".

So what about it?

This subject can only be explained by engineers, scientists and industrialists who are even now working behind locked doors to provide progress in transportation.

All who attend the Santa Clara Valley Engineers' Council symposium on the electric automobile during engineers' week, Feb. 23, 24, 25, 1967 will be privileged to look behind the curtain at your new transporter—the electric automobile. Remember February 23, 24, 25, 1967 at San Jose State College.

Rausch-Lang electric automobile, circa 1910, owned by Edward Zalinsky, San Francisco. This chain-driven sedan has been known to attain speeds of upwards of 15-16 miles per hour. At a slightly lower cruising speed, the Rausch-Lang has a range of 30-35 miles—on the level. This vintage electric auto will be on display during National Engineers Week, February 19-25, 1967 at Morris Daily Auditorium, San Jose State College. It will also be one of many exhibits of interest in a national symposium on the modern day electric automobile at the same location, February 24 & 25. Sponsors of the symposium are the Santa Clara Valley Engineers Council, which is composed of the major engineering societies in the Valley, and San Jose State College.

section news

ELECTRIC AUTO SYMPOSIUM

Friday, Feb. 24, 1967

9:00AM Registration and displays open

9:30AM Opening remarks: "What Makes The Electric Auto Run?" Dean Norman Gunderson, School of Engineering, San Jose State College.

10:00AM Presentation of papers and discussion

1. "Public Needs, Public Acceptance and Service, and Governmental Response" (Speaker to be announced)

2. Various discussions and theses on the Electric Auto by and for students from Bay Area Universities & Schools Conducted by Dean Norman Gunderson.

3. "Foreign Developments in Electric Auto Field", Gerald Curry, president, Data Technology.

12:00 M Lunch

2:00PM Presentation of papers and discussion

4. "Report from IEEE Electric Auto Committee", Bradley Cozzens, asst. to gen. mgr., Los Angeles Dept. of Water and Power.

(Continued on page 11)

SYMPOSIUM FEES

Pre-registration—Received on or before Monday, Feb. 20, 1967.

$3.00—for both Friday and Saturday sessions

$5.25—for Saturday session and Saturday banquet

$6.25—for Friday and Saturday sessions and Saturday banquet

$4.25—Banquet only

Registration after Feb. 20, 1967:

$2.00—for Friday session

$2.00—for Saturday session

$4.25—for Saturday banquet

(Reservations required)

No session charge to students or wives.

Symposium Program Committee: Hugh C. Ross, chairman, Ross Engineering Corp.; Richard B. Campi, Lockheed Missiles & Space Co.; Harrel Creasey, Peripheral Systems; George E. Gayer, Westinghouse Electric Co.; Steven W. Hamilton, Rogers Jr. High School; Burton W. Long, FMC Corporation; Donald B. Scollon, Tudor Engineering.

Santa Clara Valley Engineers Council: Donald B. Scollon, Tudor Engineering—chairman; Hugh C. Ross, Ross Engineering Corp.—vice chair-

(Continued on page 11)

meeting ahead

PACKAGING DIGITAL SYSTEMS

Robert Snyder, supervisor, product design, Philco-Ford WDL, will discuss electronic packaging of ground digital systems at the February 21 meeting of the Parts, Material & Packaging chapter at the cafeteria/library, 3825 Fabian Way, Palo Alto.

Mr. Snyder will discuss the activities involved in ground digital system design, after completion of electrical design, including documentation and fabrication. Considerations involved in design philosophy due to the transition of a computer originally designed for military into industrial/commercial usage will also be considered.

The speaker holds an MSME from the University of Santa Clara, a BA in industrial management from CCNY, and a BSME from Rutgers. He holds three patents in high speed counters and has several pending on interconnection methods. He also serves as instructor in business administration at UC Extension.

MORE EMB

Stanford University. He is particularly noted for his contributions to the thermodynamics of irreversible processes, and is the author of many publications in electrochemistry.

Prof. Kado, senior engineer at the brain research institute and assistant professor in anatomy, UCLA, is known for his contributions in flow meters, instrumentation, and studies of the impedance of nervous system tissue.

MORE EBSS

lowed by a question and answer period.

Each of the panel members has followed this project in his own field from the start and this, coupled with years of background experience, provides an exceptionally qualified panel to present a picture of the PG&E Company 500 KV system.

section news

ACM SYMPOSIUM

An evaluation of terminal systems—man-computer communications is the theme for the sixth annual technical symposium sponsored by the San Francisco Bay area chapter of the Association for Computing Machinery, to be held April 7 at the Jack Tar, San Francisco. For further information, contact A. E. Corduan, LMSC, P.O. Box 504, Sunnyvale, 94088.

Petriz

Mays

meeting ahead

LARGE SCALE ARRAYS

The design problems in obtaining large bi-polar and MOS silicon arrays using computer aids received much attention at the fall joint computer conference, '66, in San Francisco and will at the international solid state circuits conference in Philadelphia in February. The San Francisco IEEE Computer chapter has arranged for participants of these conferences to present a discussion of the latest information on the subject on February 28.

Dr. Peter B. Meyers, formerly vice president of research at Bunker-Ramo and presently manager of advanced technology research at Magnavox, will act as moderator for the presentations and discussion. Dr. Meyers organized a discussion session on this subject for the ISSCC, 1967, and has made an extensive review of state of the art.

The first speaker, Dr. Richard Petriz, is director of the semiconductor research and development laboratory of Texas Instruments. An active participant in the FJCC and the ISSCC on subjects related to the topic of this meeting, he will present a discussion touching on the materials technology base of large scale integration. He will further present his views on selected topics including the device-based and array approach to L.S.I., discretionary wiring, design by computer, and standard products versus flexible design for custom requirements.

The second speaker, Dr. Hugh Mays, formerly of IBM, is in charge of the computer aided array design project at Fairchild Semiconductor Research. He will also actively participate in the program at the ISSCC. He will present his views on the use of computers to help design large scale arrays of logic. An outline of a computer aided design system will be presented. This system makes extensive use of CRT's for man-machine interaction. An examination of existing and projected computer aided design costs indicates that they will be too high to make discretionary wiring techniques practical for any very special L.S.I. applications. Therefore, the system to be discussed is based on the premise that design costs can be spread over many units.

papers call

CIRCUIT PACKAGING

A call for technical papers to be presented at the 1967 International Electronic Circuit Packaging Symposium in San Francisco was issued this week.

The eighth annual symposium will be presented by the Western Electronic Show and Convention on August 21 and 22, concurrent with WESCON in San Francisco.

Prospective authors are invited to submit 250-word abstracts of proposed IEC Packaging Symposium papers by March 15, according to T. Glen Boe, chairman of the two-day program. A papers selection committee will make up the program based on the abstracts, and full manuscripts will be due June 15, Boe said.

Abstracts on subjects of current circuit packaging interest should be addressed to: Papers selection committee, c/o WESCON, 701 Welch Road, Palo Alto, 94304.

The symposium was presented on the University of Colorado campus in the years 1960-64. In 1965 it was held in San Francisco, concurrent with WESCON, and in 1966 in Los Angeles again was a special feature of WESCON week.

At the request of Cahners Publishing Co., originators of the symposium, WESCON assumed full sponsorship of the event starting last year.

The papers selection committee, which has served the symposium since its inception, retains responsibility for program content.

section news

TEICHEROW ON METHODOLOGY

Dan Teicherow, professor and head of division of organization sciences at Case Institute, will address a dinner meeting of the Association for Computing Machinery, January 19, at the Tangent, University near Alma, Palo Alto.

Teicherow, formerly professor of management, Stanford, will discuss methodology information system design including development of languages for stating problems in as non-procedural form as possible, development of computer algorithms for segmenting large problems and structuring data files.

The meeting is scheduled for 8, with dinner at 7 and social hour at 6.

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

POWER CHAPTER SPONSORS LECTURE SERIES ON GROUNDING PRINCIPLES

The Power chapter of the San Francisco Section is sponsoring a series of lectures on grounding principles and practices starting February 21.

Eight lectures are planned covering all aspects of basic principles and practical methods of system and equipment grounding. The major elements concerned in the protection of stations, transmission lines and distribution systems will be covered. Code requirements, corrosion problems, and electrostatic hazard control will be treated in some detail.

The lectures will be conducted on a level to provide useful and practical information to experienced engineers in the power and industrial field. Each lecture will be presented by an engineer who is well qualified in the field being discussed.

The lectures will be given in San Francisco on Tuesdays from 6:00 to 8:00 PM starting on February 21 and continuing through April 25, with the exception of March 14 and April 11, when the regular monthly Power chapter meetings are scheduled. The exact meeting location will be announced later. A list of lecture subjects and speakers follows.

I February 21
Basic Principles of Grounding, S.V. Lyon, General Electric Co.

II February 28
Substation Grounding, S.J. Schwarz, Sverdrup & Parcel & Associates.

III March 7
Distribution System Grounding (Lecturer to be announced)

March 14
Power Chapter Meeting—No lecture scheduled.

IV March 21
Transmission System Grounding, W. S. Price, Bechtel Corporation.

V March 28
Industrial Plant Grounding, Moon H. Yuen, Bechtel Corporation.

VI April 4
Control of Industrial Electrostatic Hazards, (Lecturer to be announced).

April 11
Power chapter Meeting—No lecture scheduled.

VII April 18
Corrosion problems in Relation to Grounding, Roy Dean, Pacific Gas & Electric Co.

VIII April 25
Grounding and Safety, E.E. Carlton, State of Calif., Div. of Ind. Safety.

A registration fee of five dollars will be charged to defray the costs of publications and technical papers which will be distributed to participants during the course, and to cover other expenses.

The course is open to the public. However, enrollment will be limited to a convenient class size for maximum effectiveness. Advance registration will be given preference in the event of over enrollment. For further information, contact the course coordinator or one of the professional education committee:

Wm. J. Slimak,
Course coordinator, P.G.&E. Co.
Telephone 781-4211, Extension 2529

Joel Kitchens
Committee chairman, Bechtel Corp.
Telephone 433-4567, Extension 3365

Jean V. Kresser
Westinghouse Electric Corp.
Telephone 392-5353, Extension 315

S. V. Lyon
General Electric Co.
Telephone 434-2211, Extension 406

Donald Nielsen
P.G.&E. Co.
Telephone 781-4211, Extension 4134

For advance registration, use the form below. Make chacks payable to IEEE—San Francisco chapter, Power Group, and mail to: Wm. J. Slimak, Pacific Gas & Electric Company, 245 Market Street, San Francisco, Calif. 94106

ADVANCE REGISTRATION FORM

Name (print) _____

Firm _____ Position _____

Business Address _____

_____ Phone _____

Home Address _____

Member of: (circle) IEEE, ASME, AIME, AJCE, Other _____

SOUL SEARCHING BY SYSTEMS TYPES PLANNED FEB. 7-9

"Are electronic systems creating a new and better world . . . or just a different one?" This question will be one of the key queries posed at the eighth annual winter convention on aerospace and electronic systems (WINCON) to be held February 7 through 9, Los Angeles.

"It is becoming clear that scientists and engineers engaged in complex system developments for space and for the military must now contemplate a broader role," according to Dr. A.M. Zarem, 1967 WINCON chairman and president of Electro-Optical Systems, Inc., a subsidiary of Xerox Corporation. "That role must be directed toward the realization of the socio-economic goals of our nation and of mankind as well," he said.

WINCON '67 will attempt to do this by relating the theme "new horizons in electronic systems" to a broad spectrum ranging from tactical military needs to society's problems in health, education and transportation. The meeting at the International Hotel is expected to draw approximately 4,000 and will feature many speakers from non-electronic fields.

An overview of the convention's concern with cybernetics, bionics and man/machine interfaces will be found in the opening session, "the brain—ultimate challenge to the systems engineer." This newly initiated lecture will be one in a continuing annual series to honor the memory of the late Dr. John von Neumann, Hungarian mathematician who was instrumental in computer development and a student of the interface and similarity between computer and human systems.

A total of 16 classified and unclassified sessions will be held during the three day meeting, with subjects ranging from electronic systems for meteorology to horizons in computer technology to bionics. In this latter session entitled "bionic systems—a technology in transition," it will be explained that scientists must first develop better techniques for observing human systems if man is to successfully adapt electronics to the image of living organisms. Use of psychological knowledge as a basis for system design is still generations behind the electronic state-of-the-art. Therefore, the demand is for improved methodology in obtaining the psychological inputs.

This responsibility rests equally upon the shoulders of the engineer and the psychologist, according to Dr. Malcolm Currie, WINCON technical program chairman and vice president and associate manager of the research and development division, Aerospace Group, Hughes Aircraft Co. "Subjects which were alien to yesterday's electrical engineering curriculum—metallurgy, advanced chemistry, biology—must now be mastered in order to perform today's engineering tasks and those of the future."

Dr. Currie also noted that the demands on the engineer are transcending the purely technical and extending into the world of business and social needs. "In systems applications, one must also concern himself with how a function can be performed within the political and economical constraints of the world." In information displays, for example, integrated circuits are paving the way for significant technological advances. Yet, in areas such as education, teachers are still inclined to reject such aids as displays on the grounds that they impair creativity, according to one paper which will be aired in the session on information display systems.

Aside from the regular sessions and the von Neuman lectures, two additional speakers will talk during the opening luncheon on February 7 and the banquet on February 8. While the banquet speaker has not yet been named, luncheon attendees are scheduled to hear noted physicist Dennis Gabor who will talk on "the future of western civilization." Dr. Gabor is chairman of applied electron physics, Imperial College of Science and Technology, University of London.

Participants in the first annual von Neumann lecture will be Nobel Laureate Sir John Eccles, member, Institute for Biomedical Research, E. R. F., American Medical Association, Chicago; Dr. Richard Bellman, professor of mathematics, engineering and medicine at the University of Southern California, and Dr. Dean E. Wooldridge, research associate at the California Institute of Technology. Moderator will be Dr. George M. Austin, M.D., head of the division of neurosurgery, University of Oregon Medical School.

WINCON is sponsored by the IEEE Group on Aerospace and Electronic Systems and the Los Angeles Council, IEEE. (The AIAA is co-sponsor of one session.) The concurrent classified symposium is sponsored by the USAF Systems Command, research and technology division, scientific and technical liaison office, Los Angeles, and Hughes Aircraft Co.

Registration fees are $12 for IEEE or AIAA members, $15 for nonmembers. The fees include a copy of the convention record. Additional copies of the record will be available during the convention for $7. Registration material may be obtained by writing to the IEEE, Suite 1920, 3600 Wilshire Blvd., Los Angeles, 90005. Industry sponsorship has replaced exhibits as part of the convention format.

ieee honors

WHINNERY EDUCATION MEDALIST

"For his outstanding teaching, his inspired leadership in educational administration, and his excellent pioneering textbooks," Prof. John R. Whinnery will be awarded the 1967 Education Medal of IEEE.

Dr. Whinnery received the B.S. degree in electrical engineering from the University of California, Berkeley, in 1937, and the Ph.D. degree from that institution in 1948. From 1937-1946 he worked at the General Electric Company, Schenectady, New York, in the advanced engineering program, and in research on tube and circuit problems associated with microwave radar. In 1946 he joined the University of California, Berkeley. In addition to teaching and research, he served as director of the electronics research laboratory, chairman of the electrical engineering department, serving as chairman of the San Francisco Section of IRE, in 1953-54, and from 1959-63 was dean of the college of engineering at Berkeley. On leaves from the university, he acted as head of microwave tube research at the Hughes Aircraft Company in 1952-53, and as a visiting member of the technical staff of the Bell Telephone Laboratories in 1963-64. In 1959 he was a Guggenheim Fellow at the ETH in Zurich, Switzerland.

Prof. Whinnery is a Fellow of the IEEE and served on the board of directors of the IRE for 1956-59. He is a member of the National Academy of Engineers, of Sigma Xi and the American Physical Society. He is currently chairman of the commission on engineering education. He is author and co-author of three texts and of journal articles on microwaves and quantum electronics.

MORE ELECTRIC CAR

5. "Air Pollution Relief Possibilities", John A. Maga, chief, Bureau of Air Sanitation, California Dept. of Public Health.

6. "Darkening Skies of Santa Clara Valley", Herbert C. Johnson, senior engineer, Bay Area Air Pollution Control District.

7. "Power Planning for Typical Utility Company", Stan Blois, manager, commercial, industrial, agricultural sales, Pacific Gas & Electric Company, San Francisco.

Saturday, Feb. 25, 1967

9:00AM Registration and displays open

9:30AM Opening Address: "The Electric Automobile—Past, Present & Future", Edward D. Marande, director, applied research laboratory, Ford Motor Company.

10:00AM Presentation of papers and discussion

8. "Batteries as Power Sources", M. G. Smith, vice-pres. & gen. mgr., Electric Storage Battery Co.

9. "Fuel Cells as Power Sources", Y. C. Lee, manager, power systems, Lockheed Missiles & Space Company.

10. "Progress Report on Lithium Batteries", R. C. Shair, vice president, research and development, Gulton Industries.

12:00 M Lunch

2:00PM Presentation of papers and discussion

11. "Electric Auto Research and Development", Dr. Howard Wilcox, General Motors Research Laboratories.

12. "Micro-Circuits, Semi-Conductors & Controls", William Hugle, president, Hugle Industries.

13. "Semi-Conductor Power Controls", John Mungenast, manager, market development; Neville Mapham, design application, General Electric Semi-Conductor Product Dept.

5:30PM Cocktail Party

7:30PM Banquet (San Jose State Dining Hall)

"The Electric Automobile—New Engineering Breakthrough".

spectrum erratum

"WHO SAYS IT'S THE FIRST?"

The electric automobile will be the subject of a "first" conference in this field at Columbia University, April 6-8. Also covered will be electric power systems for trucks and buses. Topics to be discussed will include the impact of the electric vehicle on urban problems such as air pollution. In the April issue of IEEE SPECTRUM, Staff Writer Nilo Lindgren will report on the results of his own research on the subject.

from IEEE spectrum, January 1967

MORE SYMPOSIUM

man; Christopher Jako, IBM Corporation—secretary/treasurer.

San Jose State College: Norman Gunderson—Dean, School of Engineering.

For information and registration: Hugh C. Ross, 11915 Shadybrook, Saratoga, California 95070, Phone (408) 253-1572.

The general public is cordially invited.

laser news

FIRST DREDGE-RANGING LASER USE IN BART TUBE DIG

Dredging vessels aligned by special gas laser instruments have begun round-the-clock excavation at the bottom of San Francisco Bay for the trans-bay tube portion of the BART trans-bay line. This is the first time lasers have been used for ranging a group of dredges working simultaneously on marine excavation. The laser equipment is a new product of Spectra-Physics, Inc. of Mountain View.

The dredges are excavating a trench approximately 20,000 feet long varying in depth of excavation from 15 feet to 85 feet and from 35 feet to 135 feet beneath the surface of the water across the bottom of the Bay between San Francisco and Oakland. Into this trench will be placed the pre-fabricated tube sections forming the tube for the rapid transit vehicles.

Because of the precision required in the sinking and placing of the tube sections and the critical size and shape of the trench, it is necessary that the personnel aboard the dredges know their exact position at all times. Any deviation, if only a few feet from the planned alignment, would result in a trench unsuitable for criteria of the project. Because of the precision required, because the planned alignment consists of two tangent sections, three horizontal spirals, and two horizontal curves, and because both ends of the project are metropolitan areas, it was impracticable, if not impossible, to utilize conventional ranging systems. Various conventional ranging systems for dredges include telephone pole-like range towers, which must be erected specially, intersecting sextant angles, which lack the accuracy required, triangulation, which requires constant manning, or trilateration, which requires the use of distance measurement equipment as well as constant manning.

Model LT-2 laser-transit instruments have been put in position at triangulated points along the water's edge, on the Ferry Building, on freeway structures, on buildings, on certain Bay Bridge Piers, on sea towers in the Bay, on waterfront piers, at the Oakland Mole, and elsewhere as necessary to satisfy the ranging and alignment requirements. Alignment of the visible laser beams is accomplished by horizontal angles from other known triangulation points. The beams are projected out over the surface of the water at pre-determined ranges and personnel on the dredges visually bring their vessels into location on the beams. The laser light is fanned vertically but is thin horizontally (approximately six inches in azimuth at one mile) and can be seen only by one who is directly in its path. The laser beams are visible in bright sunlight as well as at night, and in moderate haze or light rain.

In addition to accurate surface positioning of the dredges, there is a need for vertical control. There is a tidal differential of more than seven feet occurring about every six hours. The exact tide level, therefore, must be known by the operators on the dredges if they are to excavate to an accurate depth at the bottom. To permit them to determine the tide levels at all times, separate laser-transit instruments on the shore, piers, or towers are being posi-

(Continued on page 16)

STANFORD MED SCHOOL COMPUTER PLANNED AS COMPENDIUM

A powerful computer to help physicians and basic scientists cope with the explosively growing body of medical knowledge will be installed at the Stanford University School of Medicine.

The new project, whose applications will range from data analysis in biochemical research to acting as a superconsultant in the care of patients, was announced by Dr. Robert J. Glaser, vice president for medical affairs and dean of the school of medicine.

"It will be one of the largest installations in a medical school," Dr. Glaser said, "with a memory almost equal to all computers now available at Stanford. Organized so that it will complement rather than duplicate existing services, the new computer will eventually provide a compendium of medical knowledge already far too great for any individual physician or researcher to keep in his mind."

The new program, which will be known as Advanced Computer for Medical Research, has been made possible by a grant of $445,000 for the first year from the division of research facilities and resources of the National Institutes of Health. A planning grant of $80,000 from the Josiah Macy Jr. Foundation of New York provided the impetus for the initial planning and staffing.

The computer was manufactured by IBM. The computer program, far more ambitious than the other known undertakings in medical uses of computers, will be developed at Stanford.

The responsible investigator for the project is Dr. Joshua Lederberg, Nobel Prize winning geneticist and professor and head of the department of genetics. He will chair a committee of scientists from key medical school departments and the Stanford Computation Center, who will coordinate the activities and use of the system.

The intent of Stanford's medical computer, Dr. Lederberg explained, is to develop techniques that will substantially increase and improve collection and analysis of results of many experiments from different laboratories simultaneously.

As new programs are put into the computer and their value tested, they will become available from the Stanford Computation Center, while the medical

(Continued on page 16)

grid swings

IT IS REPORTED:

Ampex Corporation has received a contract for approximately $2,000,000 from Bell Telephone Labs to develop a videotape system to be used to store and retrieve maintanance data for the NIKE-X weapons systems, being developed for the U.S. Army to provide high speed access to a large file of maintenance data stored on video tape.

George W. Marshall has joined Western Microwave Laboratories, Inc., Santa Clara, as components sales manager, reporting to the marketing vice president.

Robert F. Dies has been named marketing services manager of Union Carbide Electronics, Mountain View, in charge of product marketing, order processing, and customer service.

Finn Jorgensen has been named to the new position as manager, recording research, Memorex Corp., Santa Clara.

Herschell C. Stansch has been appointed project engineer at Applied Technology Inc., Palo Alto, after association with Hewlett Packard for nine years, most recently serving as a project manager with the Dymec division.

Memorex Corp., Santa Clara, has announced completion of a 100,000 sq. ft. addition, along with a 40,000 sq. ft. facility under construction more than doubling its space for research, development, manufacturing, quality control and tape testing departments.

Dr. Richard C. Webb, president of Colorado Instruments, Inc., Broomfield, will head the Colorado Council of WEMA in 1967.

The Sierra Electronic Operation of Philco-Ford Corp. has been awarded a contract for an infrared nondestructive testing system for inspection, recording and evaluation of bonding flaws in helicopter rotor blades of Boeing's Vertol division.

Kaiser Aerospace & Electronics Corp., Palo Alto, has dedicated a new 72,800 square-foot electronics plant adjoining its development laboratories at 1681 Page Mill Road.

Keith Rutherford has been appointed to the newly-created post of sales manager at Zeltex, Inc., Concord.

Philco-Ford Corporation has announced establishment of a space and re-entry systems division to headquarter in Palo Alto.

Gerling

D'Amico

John E. Gerling has joined the applications engineering staff of Watkins-Johnson Co., Palo Alto, and will be primarily concerned with products of the space communication section.

Joseph T. D'Amico has been named director of material for the microelectronics division of the Philco-Ford Corporation, Santa Clara.

Stanford's $4,460,000, 116,000 sq. foot space engineering and science building and related facilities will be begun early in 1967 and completed about two years later to serve 50 faculty members, 40 research associates, and 180 graduate students from a dozen departments, Air Force and NASA grants, along with the corporate gift program, making it possible.

Hans Mynlieff has been appointed southwestern regional sales manager of the Philco-Ford microelectronics division, Santa Clara.

Hewlett-Packard Co. reported an increase in net earnings from $13,678,000 in 1965 to $17,445,000, a gain of 28 per cent.

Robert E. Ankers has been named director of marketing and field offices, Washington, D.C., for Applied Technology, Inc., Palo Alto.

Harry E. Page has been promoted to director of manufacturing and John W. King to manager of production manufacturing, Applied Technology, Palo Alto.

Applied Technology, Inc., has been awarded a $1,768,000 contract by the U.S. Air Force for electronic equipment for the B-52 series aircraft, bringing the electronic firm's current backlog to an all-time high of $26 million. This figure represents a 200 per cent increase over the backlog at this time last year.

James E. Rogers has been promoted to manager of the newly formed application engineering department of Pulse Engineering, Inc., Santa Clara.

MORE SWINGS

Lockheed Missiles & Space Co., Sunnyvale, has received an $85,000 contract from Far West Laboratory for Educational Research and Development (U. S. Office of Education) San Francisco, to design a computerized system by which all public schools in northern California and most of Nevada could draw mutually on new findings in educational research. The award marks the first time federal funds earmarked for educational research and development have been administered through a contract with private industry.

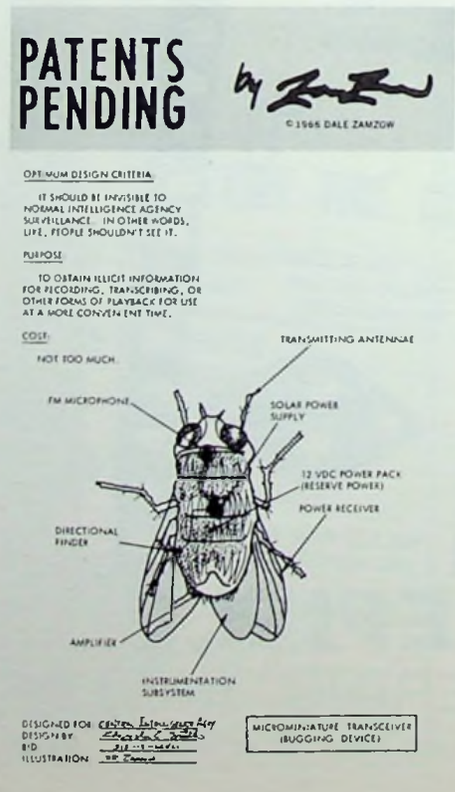
Ultek Corp., Mountain View, has announced the appointment of Robert Yarborough as national sales manager; Eric Eklund as western regional sales manager; and Bert Allen as midwest regional manager.

United Control Corp., Seattle, has announced receipt of a $900,000 contract for avionics equipment for the Air Force's giant C-5A military jet transport, designed and built by the Lockheed-Georgia Co., the largest aircraft of its kind to be put in production.

MORE MED SCHOOL COMPUTER

installation will be used for further systems research and other special applications.

Through the process of "time-sharing," the medical computer will constantly monitor scores of scientists' instruments, which will be located in the Medical Center and connected by cables to the machine. The system will permit a dialogue between doctor and computer during the experiments.



Hewlett-Packard employees of its Delcon Division, western service center, and Datamec Division have moved into a new, two-building, 65,000 square-foot facility at Logue Avenue and Middlefield Road in Mountain View.

William S. O'Hare has joined Applied Technology, Inc., Palo Alto, as a senior systems engineer, formerly serving Airtronics, General Precision, Raytheon, and Westinghouse Electric.

Bill D. McNary has been appointed director of microwave components at Huggins Laboratories, Sunnyvale, formerly serving as manager of manufacturing for high power microwave tubes at Varian/Eimac, San Carlos.

Jack Pyle Co., San Mateo, components sales representatives, has acquired Birnbaum Sales Corp., Redwood City.

MORE LASER RANGING USE

tioned to project a flat, fanned-out beam parallel to the surface of the water. The tide can be checked by observing the beam at a calibrated staff on the deck of the dredge vessel. The staff is adjusted relative to the present draft of the vessel.

Jorgensen

Kolehmainen

Finn Jorgensen has been named to the new position as manager, recording research, Memorex Corp., Santa Clara.

Elmar Kolehmainen has been named manager of value engineering at Dalmo Victor, a Textron Division, Belmont, and will be responsible for implementing value engineering programs and training. Prior to joining Dalmo Victor, he was a value engineering specialist at Lockheed and manager of engineering services at Melabs, Palo Alto.

Lockheed Missiles & Space Co., Sunnyvale, has received a $24,500 contract from the State Department of Professional and Vocational Standards to produce a system for increased application of electronic data processing techniques to the administration of 700,000 occupational licenses.

MORE NOMINATIONS

(continued from page 5)

MORE MC MURTRY

and design of traveling-wave amplifiers, klystrons, and interdigital backward-wave oscillators. In 1959 and 1960 he developed and programmed generalized traveling-wave tube design procedures for the IBM 704 digital computer. Also during that time he used the computer for work on some electromagnetic scattering problems with Dr. E. T. Jaynes of Stanford University. In 1960 and early 1961 he worked on the theoretical analysis and design of millimeter-wave backward-wave oscillators. From April 1961 until June 1962 he was engaged in research under the direction of Professor A. E. Siegman at Stanford University, and during the 1961-62 academic year he was the Raytheon Fellow. In mid-1961 he and Professor Siegman conducted conclusive optical heterodyne experiments involving microwave difference frequencies; those experiments demonstrated for the first time that the ruby laser generally oscillates at more than one frequency simultaneously. His subsequent photomixing experiments produced time-resolved, high resolution spectroscopic information about the output of ruby lasers. From June 1962 until December 1963 he was head of the Optical Device Department at the Mountain View Components Laboratory of Sylvania's Microwave Device Division. In that position he contributed to programs on traveling-wave phototube (TWP) analysis and development, optical heterodyne demodulation, high frequency optical mixing, FM demodulation, and scannable TWPs. In May 1964 he was selected as the recipient of the 1963 Alfred Noble Prize. Dr. McMurtry has authored papers in the fields of microwaves and optics, and is a member of Tau Beta Pi, Sigma Xi, Sigma Tau, The Scientific Research Society of America, The Institute of Electrical and Electronics Engineers, The American Physical Society, The Optical Society of America, and The American Association for the Advancement of Science.

MORE PEDERSON

electrical engineering, University of California, Berkeley, where he is now a professor. From 1960 to 1964, he was also director of the electronics research laboratory. His research interests are primarily in the field of electronic circuits. In 1964, he was a Guggenheim Fellow. Dr. Pederson is a member of Sigma Xi and Eta Kappa Nu. In IEEE he has been a member of the ADCOM for Circuit Theory and a member of the Committee on Solid State Center. He has served as chairman and vice-chairman of the East Bay Subsection.

MORE PAPPENFUS

munications committee, IEEE. Chairman, engineering manager lunch-seminar, 1966, WEMA. Member, San Francisco Section Fellows Committee, 1965, 1966, 1967. Vice-chairman, WESCON technical program committee, 1967.

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, only ballots received prior to 5 p.m. on that date being considered valid. The incoming officers shall assume the duties on or before July 1 on a date fixed by the outgoing executive committee."

Members of the nominating committee, appointed by Section Chairman E. H. Hulse, were Jack L. Melchor, chairman; P. D. Lacy, V. E. Kaste, E. F. Carter, and A. J. Morris.

Manufacturer / Representative Index

Acoustronics, Inc. ..... Frauman Associates
Adtech ..... Jay Stone & Assoc.
Applied Dynamics, Inc. ..... J. D. Kennedy Co.
Associated Testing Labs ..... Dietrich-Heffner
Astec, Inc. ..... V. T. Rupp Co.

Beckman/Computer Operations ..... V. T. Rupp Co.
Beckman/Invar Electronics ..... T. Louis Snitzer Co.
Belonus Built-Instruments ..... Dietrich-Heffner Assoc.
Berand-Rex Div. of
American Enka Corp. ..... L & M Engineering

Canoga Corporation ..... Jay Stone & Assoc.
Cannier Products Corp. ..... Wadsworth Pacific Mfg.
Ceramagnetics, Inc. ..... Wadsworth-Pacific Mfg. Assoc.
Ceramaseal, Inc. ..... Wadsworth-Pacific Mfg. Assoc.
Ceomputer Instruments Corp. ..... Bill Coe & Assoc.
Ceomputer Test Corporation ..... King Engineering
Custom Materials, Inc. ..... Jay Stone & Assoc.
Cybetronics, Inc. ..... Data Associates

Data Instruments ..... W. K. Geist Co.
Data Technology Corp. ..... T. Louis Snitzer Co.
Dielectric Products Eng. Co. ..... Jay Stone & Assoc.
Dymetronics Corp. ..... Components Sales Calif.
Dynamic System Electronics Corp. ..... King Engineering

Eldorado Electronics ..... T. Louis Snitzer Co.
Electro Cube Inc. ..... Nickerson-Gray & Assoc.
Electronic Engineering Co. ..... Data Associates
Electro Optics Associates ..... O'Halloran Assoc.
Electro Products Labs, Inc. ..... King Engineering
Electro Switch Corp. ..... Willard Nott & Co.
Elgar Corp. ..... V. T. Rupp Co.
Elgenco, Inc. ..... V. T. Rupp Co.
Emcor-Borg-Warner Corp. ..... T. Louis Snitzer Co.
Eppley Laboratory, Inc. ..... W. K. Geist Co.

Fairrand Controls, Inc. ..... W. K. Geist Co.
Fluke-ohm Corp. ..... Walter Associates

General Computers ..... V. T. Rupp Co.
General Resistance, Inc. ..... W. K. Geist Co.
Genisco Systems, Inc. ..... King Engineering
Glow-Lite Corp. ..... Wadsworth-Pacific Mfg. Assoc.
Gorombos Microwave ..... Walter Assoc.
Grayhill, Inc. ..... Nickerson-Gray & Assoc.
Guildline Instruments ..... T. Louis Snitzer Co.

Hallmark Standards, Inc. ..... T. Louis Snitzer Co.
Hewlett Instruments Laboratories ..... W. K. Geist Co.
Houston Omnigraphic Corp. ..... V. T. Rupp Co.
Howard Industries ..... Nickerson-Gray & Assoc.

Inland Testing Laboratories ..... W. K. Geist Co.
Intercontinental Instruments Inc. ..... T. Louis Snitzer

Kepco, Inc. ..... V. T. Rupp Co.
Kilovolt Corp. ..... Dietrich-Heffner

Lambda Electronics Corp. ..... Jay Stone
Leider & Demyan, Inc. ..... Wadsworth Pacific Mfg.

McLean Engineering Labs ..... T. Louis Snitzer Co.
Micro Instrument Co. ..... Jay Stone & Assoc.
Micro-Power Inc. ..... Walter Associates
Micro-Tel Corp. ..... Walter Associates
Microlab-FXR Div. of Microlab ..... L & M Engineering
Microwave Electronics Corp. ..... Jay Stone & Assoc.
Millitest Corp. ..... Components Sales Calif.

Nanofast ..... Dietrich-Heffner
Nanosecond Systems ..... V. T. Rupp Co.
NH Research, Inc. ..... W. K. Geist Co.
The Nortronics Co. ..... Nickerson-Gray & Assoc.

Omni Spectra Inc. ..... Walter Associates

Pastoriza Electronics ..... W. K. Geist Co.
PRD Electronics ..... T. Louis Snitzer Co.
Polarad Electronic Instruments ..... T. Louis Snitzer
Precision Mechanisms Corp. ..... Components Sales

Quan-Tech Labs ..... Jay Stone & Assoc.

Reeves-Hoffman Div. of
Dynamics Corp. of America ..... L & M Engineering
Royal Microwave Devices ..... Walter Associates
Roytron Division, Litton Indus. ..... Costello

Scott, Inc., H. H. ..... W. K. Geist Co.
Sierra Electronic Div., Philco ..... T. Louis Snitzer Co.
Singer/Metrics/Gertsch ..... Dynamic Associates
Sony Corp., Ind. Prod. ..... V. T. Rupp Co.

Taylormade Laboratories ..... Data Associates
Technipower, Inc. ..... Dietrich-Heffner Assoc.
Telonic Instruments & Eng. ..... T. Louis Snitzer Co.
Texas Instruments, Ind. Prod. ..... V. T. Rupp Co.
T R W Instruments ..... V. T. Rupp Co.
Trymetrics Corp. ..... T. Louis Snitzer Co.

Union Carbide Electronics ..... Jay Stone & Assoc.

Vero Corporation ..... Wadsworth-Pacific Mfg. Assoc.

Warren Components ..... Wadsworth-Pacific Mfg. Assoc.
Watkins-Johnson Co. ..... L & M Engineering
Waveforms, Inc. ..... W. K. Geist Co.
Weinschel Engineering, Inc. ..... Jay Stone & Assoc.
Wiltron Co. ..... O'Halloran Assoc.
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education notes

WELDING SERIES

Santa Clara American Welding Society Educational Series. "Welding, Brazing, and Soldering in the Electronics Industry." February 2, 7, 9, 14 and 16, 1967. 7:30 PM Lockheed Auditorium, Palo Alto. Contact Ron Anderson, Varian, 326-4000.

new books

TWO BY STANFORD AUTHORS

Two new books, one an electronics text and the other a reliability engineer's handbook, have been published by faculty members of the Stanford School of Engineering.

"Circuits, Devices, and Systems" (John Wiley & Sons, 776 pp., $11.95) authored by Prof. Ralph J. Smith of the Electrical Engineering Department is now available in bookstores. It is intended as a first course in electrical engineering for all engineering students.

"Reliability Handbook" (McGraw-Hill, 688 pp., $22.50) was edited by Prof. W. Grant Ireson, head of the Department of Industrial Engineering. Each of 17 sections in the book was written by an authority on the subject, and the book provides coverage of all aspects of reliability from design stage to field use and maintenance. It contains detailed information on mathematical and statistical techniques used in designing, conducting and evaluating test programs.

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