

## EDITOR'S PROFILE of this issue

*from a historical perspective ...*

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

April, 1969:

Cover: The lunar surface magnetometer intended for the Apollo 12 mission is shown. More on page 6.

Page 8: Alan Grebene of Signetics gives a talk on "Frequency-Selective Circuits using Phase-Lock Techniques". Later he expands on Bob Widlar's work on opamps to develop phase-locked loop patents for Signetics. He co-founded Exar, then Micro Linear, to further that work. Later, he wrote a book called "Analog IC Design".

Page 9: Donald Fink is recognized for his editing of two key Handbooks for electrical engineers. He had been the editor of the *Proceedings of the IRE* (later, of the IEEE), as well as editor of *Electronics Magazine* (where I had a short article published). As president of the IRE in 1958 (after Bill Hewlett), he worked toward a partnership of IRE and AIEE, which merged to become the IEEE in 1963. He was IEEE's first General Manager. When Bud Eldon was a Stanford student and wanted to try his hand at publishing an article, his roommate Lew's dad (who was Fred Terman) suggested he contact Fink at Electronics Magazine; Bud was able to write and publish several articles.

Page 10: John McCarthy, head of the Stanford Artificial Intelligence Laboratory (SAIL), participates in a panel discussing "Ultimate Limitations for Intelligent Machines?"



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

[https://ethw.org/IEEE\\_San\\_Francisco\\_Bay\\_Area\\_Council\\_History](https://ethw.org/IEEE_San_Francisco_Bay_Area_Council_History)

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

April, 2025

Contact [p.wesling@ieee.org](mailto:p.wesling@ieee.org)



# Grid



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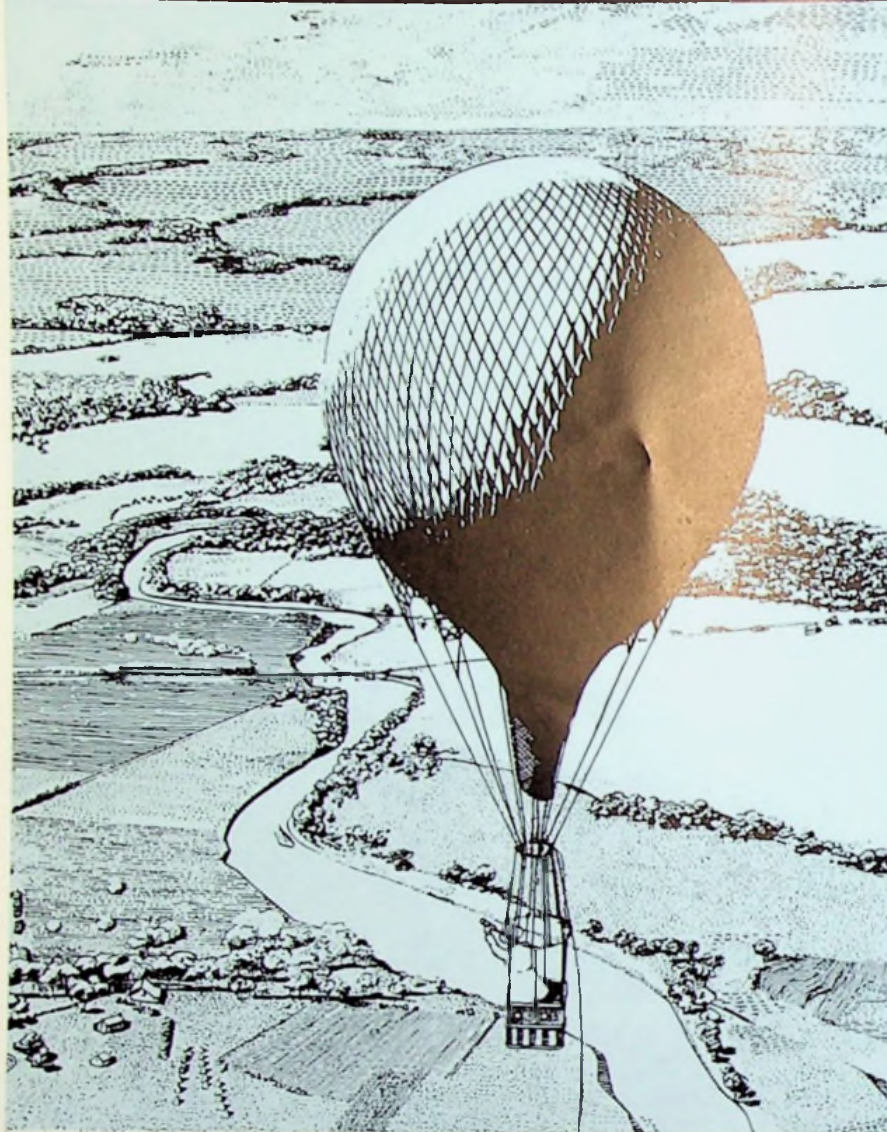
## REGION SIX CONFERENCE

APRIL 1969





## A Page From The History of Surveillance



Using his balloon, "Great Western," in which he had been making exhibition flights, T. S. Lowe joined the Union forces as the first military balloon observer in the United States. In this capacity he reconnoitered enemy positions and aided artillery in directing its fire. Lowe later became one of the nation's outstanding astronomers as head of Lowe's Observatory in California.

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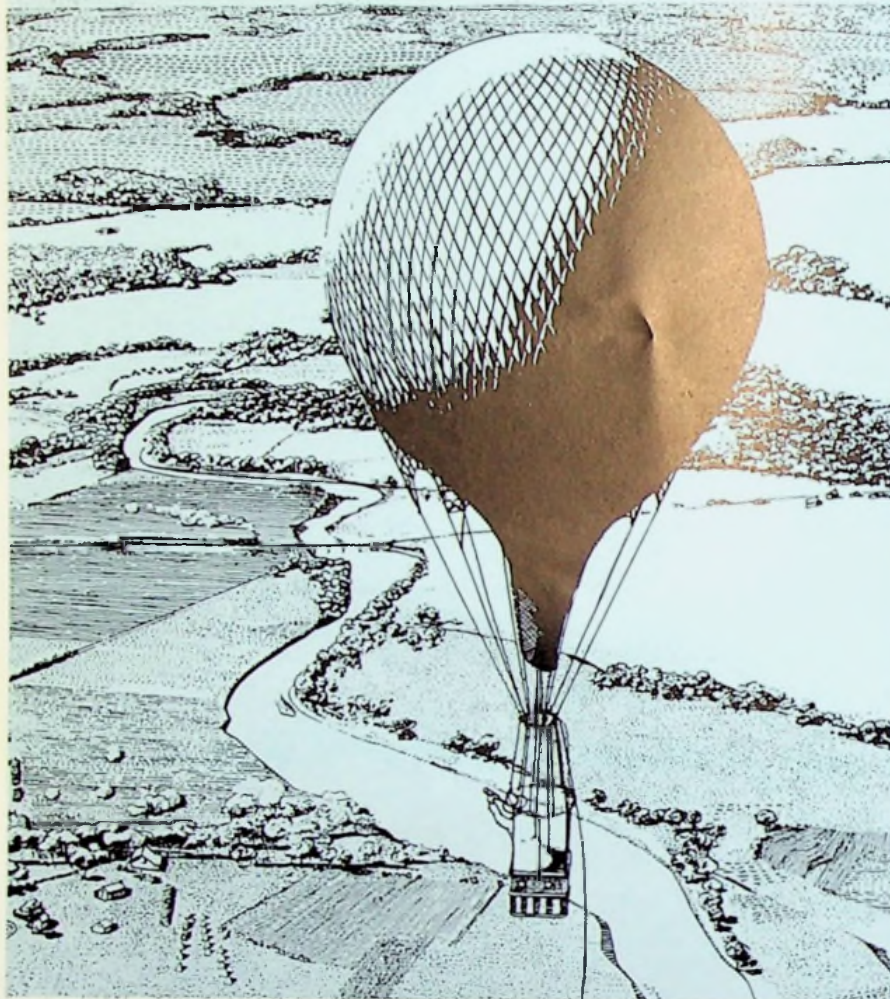
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## A Page From The History of Surveillance



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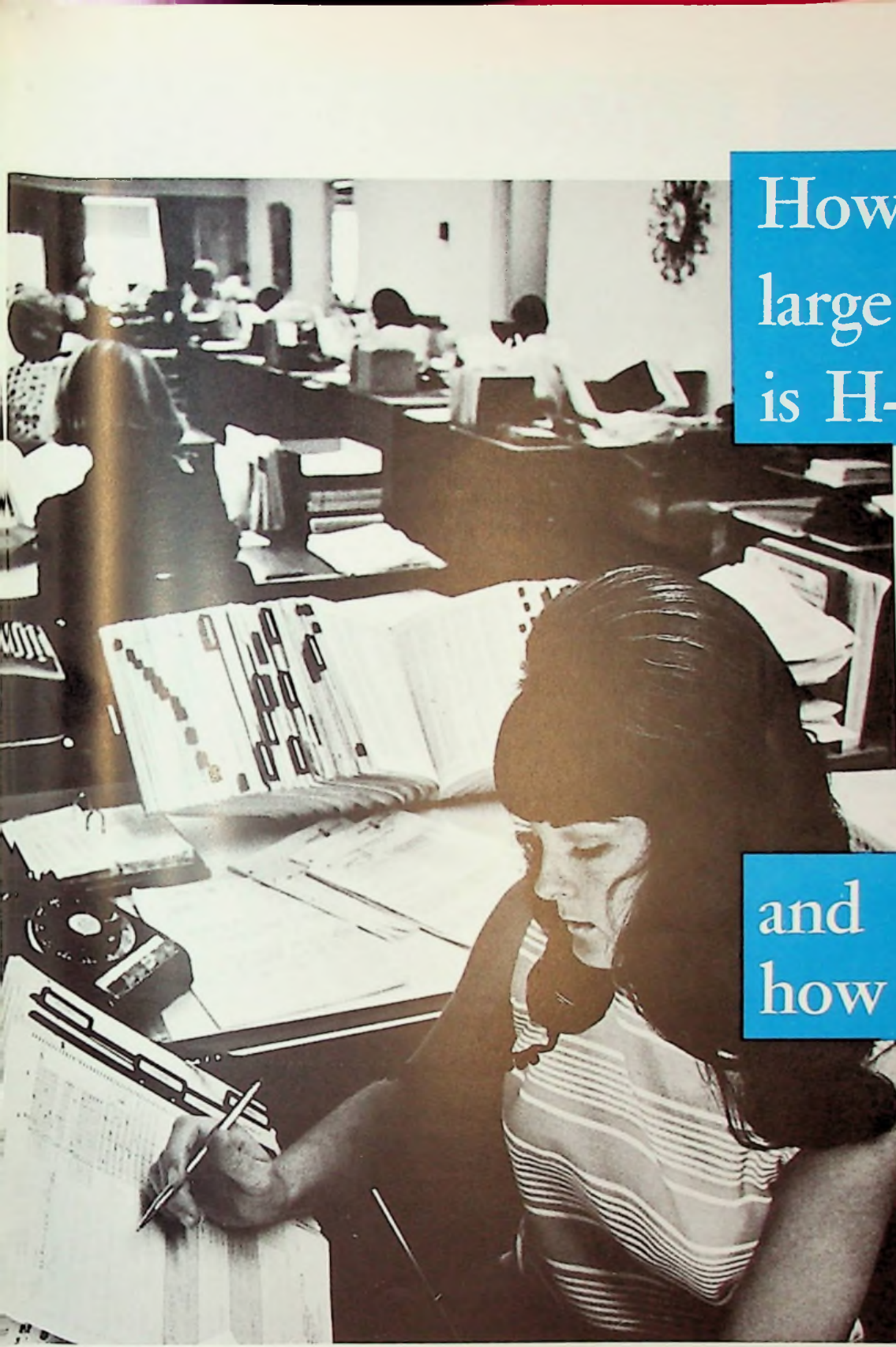


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### ON THE COVER

The lunar surface magnetometer for Apollo 12 is an instrument used as "Apollo Lunar Surface Experiment" to measure the magnetic field on the surface of the moon.

The instrument weighs 19 pounds, draws 3.5 watts of power and occupies volume of 2700 cubic inches. It contains approximately 1300 active, 1800 passive and 3300 memory core electrical components. The experiment is self-contained and has a mechanical and thermal subsystem which will allow operation for a minimum period of one year in the lunar surface.

Dr. Palmer Dyal of NASA will discuss this topic at the April 24th meeting of the AES Chapter. Story on page 6.

*Grid*

volume 15  
number 8

APRIL 1969

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# Meeting Calendar

**AEROSPACE &  
ELECTRONIC  
SYSTEMS**  
APR. 24

Story on  
page 6

**LUNAR SURFACE MAGNETOMETER FOR  
APOLLO 12.** Dr. Palmer Dyal, Research Scientist,  
NASA/Ames Research Laboratory. **ELECTION  
MEETING:** Come and vote for next year's offi-  
cers.

APRIL 24, Thursday, 8:00 PM, Lockheed Auditorium, Bldg. 202, 3251 Han-  
over St., Palo Alto. No Dinner.

**ANTENNAS &  
PROPAGATION**  
APR. 10

Story on  
page 7

**COMPUTER SIMULATION OF HF SKY WAVES.**  
Dr. Thomas A. Croft, Stanford University.

APRIL 10, Thursday, 8:00 PM, Lockheed Auditorium, Bldg. 202, 3251 Han-  
over St., Palo Alto. Dinner: 6:00 PM, Rick's Swiss Chalet, 4085 El Camino  
Way, Palo Alto. Reservations: Dr. Allen Smoll, 326-4350, ext. 5854 by 4/9.

**CIRCUIT  
THEORY**  
APR. 16

Story on  
page 8

**FREQUENCY SELECTIVE CIRCUITS USING  
PHASE-LOCK TECHNIQUES.** Alan B. Grebene,  
Signetics Corp., Sunnyvale.

APRIL 16, Wednesday, 8:00 PM, 134 McCullough Bldg., Stanford. Dinner:  
6:00 PM, Ming's, 1700 Embarcadero Road, East Palo Alto. Reservations: Mrs.  
Janet Delaney, 692-3705 by April 15.

**COMMUNICATIONS  
TECHNOLOGY**  
APR. 16

Story on  
page 8

**UNDERWATER COMMUNICATIONS.** Dr. Leon  
Camp, University of California at Los Angeles.

APRIL 16, Wednesday, 8:00 PM, Lockheed Auditorium, Bldg. 202, 3251  
Hanover, Palo Alto. No host cocktails at 5:45 PM and dinner at 6:15 PM at  
Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto. Reservations for dinner:  
Milt Seymour (415) 593-8491, or Paul Ahern, (408) 291-4415 by April 15.

**COMPUTER**  
APR. 22

Story on  
page 12

**THE CACHE CONCEPT FOR LARGE-SCALE  
COMPUTERS.** Donald H. Gibson, Technical Sup-  
port Development Engineer, Poughkeepsie, New  
York.

APRIL 22, Tuesday, 8:00 PM, Room 134, McCullough Bldg., Stanford. Din-  
ner: 6:15 PM, Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto. Reserva-  
tions: Tom Whitney, 326-7000, ext. 3112 or 2707 by 4/21.

**EDUCATION**  
APR. 26

Story on  
page 7

**THE HISTORICAL DEVELOPMENT OF ELEC-  
TRONICS IN THE BAY AREA.** Earl Goddard,  
Chairman, IEEE Historical Committee and a mem-  
ber of the Board of Directors at Perham Founda-  
tion.

APRIL 26, Saturday, 10:00 AM, Cogswell Polytechnical College, corner of  
Folsom and Army Sts., San Francisco. The parking lot is on 26th St. between  
Folsom and South Van Ness. Coffee and doughnuts will be served at 9:30  
AM. For further information contact: Cal Thacker at (415) 647-1473.

**ELECTROMAGNETIC  
COMPATIBILITY**  
APR. 21

Story on  
page 16

**SPACE RADIATION CHALLENGES THE MOS-  
FET.** Roy O. Lange, Senior Design Engineer,  
Lockheed M & S Co.

APRIL 21, Monday, 8:00 PM, Hewlett-Packard Auditorium, 1501 Page Mill  
Road, Palo Alto. Dinner: 6:00 PM, Rick's Swiss Chalet, 4085 El Camino Way,  
Palo Alto. Reservations: Bill Swift, 326-7000, ext. 3088 by noon 4/21.

**INDUSTRY &  
GENERAL  
APPLICATIONS**  
APR. 17

Story on  
page 9

**SPECIAL CONSIDERATIONS NECESSARY  
DUE TO INCREASING SIZE OF POWER CEN-  
TER TRANSFORMERS.** Stanley S. Browne and  
James C. Wilson, Westinghouse Electric Corp.

APRIL 17, Thursday, 7:30 PM, Insurance Securities Bldg., 100 California St.,  
San Francisco, Dining Room B. Dinner: 6:30 PM, \$4.50 including tax & tip.  
Reservations: Miss Madrid, 764-7757 by 4/14.

**INFORMATION  
THEORY**  
APR. 17

Story on  
page 7

**TRANSLATION OF INVARIANT SUBSPACES  
AND FILTERING PROBLEMS.** Dr. Kung Yao,  
Staff Engineer at Hughes Aircraft Co.

APRIL 17, Thursday, 8:30 PM, Stanford Research Institute, Conference  
Room B, Bldg. No. 1, 333 Ravenswood Ave., Menlo Park. Dinner: Ming's,  
1700 Embarcadero, East Palo Alto at 6:15 PM. Reservations: Mrs. Mary  
Rodimon, 966-3217 by 4/16.



**MICROWAVE THEORY  
& TECHNIQUES**  
APR. 10

Story on  
page 18

**MICROWAVE TRANSISTOR SEMINAR: KNOW-  
ING MICROWAVE TRANSISTORS BETTER.**  
Speakers from six different organizations will dis-  
cuss topics of current interest to circuit designers.

APRIL 10, Thursday, TWO SESSIONS: 1:30 to 5:00 PM and 7:00 to 9:30  
PM. Dinner between sessions. Fee: \$1.00 advance registration; \$2.00 late  
registration. Registration and detailed program information to be announced  
in circular. SLAC Auditorium, Sand Hill Rd., Menlo Park.

**PARTS, MATERIALS  
& PACKAGING**  
APR. 22

**THE FIFTH OF THE SLIDE/TAPE LECTURE  
SERIES.** Comments by Dr. Donald A. McWilliams.  
**FUTURE MANUFACTURING METHODS:** Maur-  
ice Nelles, University of Virginia. **RELIABILITY  
CHARACTERISTICS OF INTEGRATED CIR-  
CUITS.** B. Tiger and D.I. Troxel, RCA, Camden, N.J.

APRIL 22, Tuesday, 7:30 PM, Hewlett-Packard Co., 1501 Page Mill Road,  
Palo Alto, Bldg. 5, Conference Room 5M. No dinner.

**POWER**  
APR. 8

Story on  
page 6

**EXPERIENCE IN OPERATING THE PACIFIC  
NORTHWEST-SOUTHWEST 500 KV INTERTIE.**  
E. F. Kaprielian, Manager, Power Control at  
PG&E, San Francisco.

APRIL 8, Tuesday, 7:30 PM, Engineers Club of S.F., 160 Sansome St., San  
Francisco. Cocktails: 5:30 PM; Dinner: 6:30 PM. Reservations: Engineers  
Club, 421-3184 by 4/7.

**RELIABILITY**  
APR. 17

**PRODUCT LIABILITY: (1) FILM AND DISCUS-  
SION ON ALBUM OF PUBLIC SAFETY, H. J.  
Chateau, Underwriters Laboratories. (2) PROD-  
UCTS LIABILITY OF PHILCO-FORD SRS  
PRODUCT, K. O. Kelly, Philco Ford, SRS Div. (3)  
HOW GENERAL ELECTRIC REMOVED THE  
X-RAY EFFECTS FROM TV SETS, Richard  
Rysavy, Asst. Mgr., GE No. Calif. Major Appliance  
Service Center.**

APRIL 17, Thursday, 8:00 PM, PH 101, Stanford. Cocktails 6:00 PM, dinner  
6:30 PM at Stanford View Restaurant, 1921 El Camino, Palo Alto. Reserva-  
tions: W. W. DeVille, 326-4350, ext. 6133 or W. L. Finch or Fran Hamada,  
743-1577 by 4/16. LADIES NIGHT.

**SANTA CLARA  
VALLEY SUBSECTION/  
USNPG SCHOOL  
STUDENT BRANCH**  
APR. 26

Story on  
page 14

**VISIT TO COMSAT EARTH STATION.** Busses  
will leave from USNPG School in Monterey at  
1:00 PM sharp. Wives and guests are invited.

APRIL 26, Saturday, 1:00 PM, COMSAT's Antenna installation at James-  
burg, Carmel Valley. Social hour 5:00 PM, followed by dinner in the El Prado  
Room of the Naval Officer's Club. \$4.75 each. Reservations required for trip  
and/or dinner: Mrs. Chris Montez, (408) 291-4014 before 4:15 PM April 23.  
Monterey: Lt. P. F. Grasser, USNPGS (408) 646-2231.

**SYSTEMS SCIENCE  
& CYBERNETICS**  
APR. 10

Story on  
page 11

**DECISION ANALYSIS: THEORY AND PRAC-  
TICE.** Prof. Ronald A. Howard, Stanford Univer-  
sity. **ELECTION MEETING.**

APRIL 10, Thursday, 8:00 PM, Stanford Research Institute, Conf. Room B,  
3133 Ravenswood Ave., Menlo Park. Dinner: 6:00 PM, Rick's Swiss Chalet,  
41085 El Camino Way, Palo Alto. Reservations: Marge Hensley, 246-4642 by  
4/9.

**SYSTEMS SCIENCE  
& CYBERNETICS**  
MAY 1

Story on  
page 10

**PANEL DISCUSSION: ULTIMATE LIMITA-  
TIONS FOR INTELLIGENT MACHINES.**

MAY 1, Thursday, 8:00 PM, Stanford Research Institute Main Conference  
Room, Bldg. 44, 333 Ravenswood Ave., Menlo Park. Dinner: 6:00 PM, Coach  
and Six (formerly Stone Cellar) 1906 El Camino, Menlo Park. Reservations:  
Marge Hensley, 246-4642 by 4/30.

**VEHICULAR  
TECHNOLOGY**  
APR. 21

Story on  
page 10

**HYBRID ELECTRIC VEHICLE DRIVES.** Paul  
Edison Pulliam, P.E. Electrical Engineer in Plant  
Facilities, Ampex Corp., Redwood City.

APRIL 21, Monday, 8:00 PM, Golden Steer Restaurant, 768 Woodside Road,  
Redwood City. Cocktails: 6:00 PM; dinner 6:30 PM. Reservations: Bill Nye,  
3828-1200 or Al Isberg, 433-3800 by 4/21.

APRIL 1969

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# Phoenix Section Hosts Region 6 Conference

Dr. Willenbrock  
keynote speaker



IEEE RESOURCES ROUNDUP is the theme of the Region 6 Conference to be held April 16, 17, and 18 at Del Webb's TowneHouse, Phoenix, Ariz. A panel discussion and 42 technical papers have been accepted for presentation, according to Program Chairman Sloan D. Robertson. Approximately 1000 engineers are expected to hear the keynote address by IEEE President Dr. E. Karl Willenbrock.

The panel discussion SPECTRAL RESOURCES, to be held 9:00 a.m., Thurs., Apr. 17, will be moderated by Dr. W. L. Everitt, Chairman of the National Academy of Engineering Committee on Telecommunications. Included on the panel are The Honorable James D. O'Connell, Director of Telecommunications, Office of the President; Dr. James Hillier, Vice President, RCA; Mr. Richard P. Gifford, chairman, Joint Technical Advisory Committee; and Dr. John Richardson, Executive Secretary of the National Academy of Engineering.

The technical papers will be divided into eight sessions as follows:

**KEYNOTE Session I-A** – Wed., 9:30 a.m.; Chairman: John M. Ross, Phoenix Section Chairman. Three papers will be presented in addition to Dr. Willenbrock's address: **HUMAN RESOURCES – EDUCATION** by Dean Lee P. Thompson, College of Engineering Sciences, Arizona State University; **SAY SOMETHING IN ENGINEERING** by Arthur E. Judd, Diversified Consultants, Cloudcroft, N.M.; and **REGISTRATON – A PROFESSIONAL RESOURCE** by Rex A. Tynes, P.E., member, Nevada State Board of Registered Professional Engineers.

**POWER SYSTEM STABILITY AND PERFORMANCE Session I-B** – Wed., 1:45 p.m.; Chairman: T. M. Morong, Salt River Project. **POWER SYSTEM STABILITY AND PERFORMANCE** by R. H. Hartley, Arizona Public Service Co.; **METHODS FOR DETERMINING POWER SYSTEM STABILITY USING THE THEOREMS OF LIAPUNOV** by Professor John D. Morgan, Dept. of EE, University of Missouri-Rolla, and Dr. Truet B. Thompson, Dept. of EE, Arizona State University; **DYNAMIC STABILITY TESTS AT FOUR CORNERS** by R. G. Farmer, Arizona Public Service Co., R. P. Schultz and M. Temoshok, General Electric Co.; **AUTOMATIC CONTROL DISPATCHING SYSTEMS FOR HYDROELECTRIC INSTALLATIONS ON THE SALT RIVER** by L. K. Thompson, Salt River Project; and **DESIGN AND USE OF BRAKING RESISTORS** by Robert H. Park, Consulting Engineer, Brewster, Mass.

**AVIONICS RESOURCES Session I-C** – Wed., 1:45 p.m.; Chairman: Dr. Richard Andeen, Sperry Flight Systems Divn.; **ELECTRONIC ADVANCES IN AUTOMATIC FLIGHT CONTROL** by S. S. Osder, Sperry Flight Systems Divn.; **A LIGHT WEIGHT UHF RANGING SYSTEM**, S. H. Black, Sperry Flight Systems Divn.; **OPLE DATA ANALYSIS** by Richard O'Bryant, Texas Instruments, Inc.; **EARTH RESOURCES DETERMINATION WITH TERRAIN IMAGING RADAR** by L.

C. Graham, Goodyear Aerospace Corp.; **SOME APPLICATIONS OF ANAMORPHIC HOLOGRAPHY**, R. K. Peterson, Goodyear Aerospace Corp.; and **UHF CONVERSION – TRANSMITTER AVAILABILITY** by R. W. Franks and G. M. Cnudde, Lockheed Missiles and Space Co.

**THE GREAT ELECTRICAL CAR RACE Session II-B** – Thurs., 2:30 p.m.; Chairman: Dr. J. A. Narud, Motorola Semiconductor Products Divn. Papers in this session concern the recent race between two electrical cars entered by MIT and CIT. MIT – **TAPE RECORDING OF THE RACE AND IMPLEMENTATION AND PERFORMANCE CHARACTERISTICS OF MIT ELECTRONIC MOTOR** by Dr. Richard D. Thornton, Massachusetts Institute of Technology; **CIT – VIEWS OF THE RACE AND IMPLEMENTATION AND PERFORMANCE OF CIT MOTOR WITH COMMENTS ON POWER SOURCE** BY W. E. Rippel, California Institute of Technology.

**ENERGY RESOURCES Session III-A** – Fri., 9:00 a.m.; Chairman: T. A. Phillips, Vice President, Engineering, Arizona Public Service Co. **SALT RIVER HYDRO EXPANSION AND FREQUENCY UNIFICATION** by T. M. Morong, E. J. Lauer, and J. A. Hollowell, Salt River Project; **THE MONTEZUMA PUMPED STORAGE PROJECT** by Edgar A. Cooper, Harza Engineering Co.; **FUTURE TRANSMISSION VOLTAGE LEVELS** by L. O. Barthold and D. D. Wilson, General Electric Co., Schenectady; **ESTHETICS FACTORED INTO SUBSTATION DESIGN – SALT RIVER PROJECT** by Pat Sawtelle, Salt River Project; **DETERMINATION OF MICROSCALE ROUGHNESS OF CYLINDRICAL SURFACES USING ULTRASONIC CREEPING WAVES**, by H. S. Hayre and G. Vroulis, University of Houston; and **THE RELATIONSHIP BETWEEN SETTLING TIME AND SIGNAL BANDWIDTH IN DISTRIBUTED MICROWAVE NETWORKS** by Gerald F. Ross, Sperry Rand Research Center.

**COMPUTER RESOURCES Session III-B** – Fri., 9:00 a.m.; Chairman: Dr. Mervin B. Hogan, General Electric Co. **THE ASSOCIATIVE PROCESSOR – A NEW COMPUTER RESOURCE** by J. A. Rudolph, Goodyear Aerospace Corp., Akron; **EFFECTIVENESS OF TIME SHARING SYSTEMS IN CIRCUIT DESIGN AND ANALYSIS** by Harvey Haskew, General Electric Co., Huntsville; **IDENTIFICATION OF BOOLEAN SYMMETRIC FUNCTIONS** by E. R. Robbins and M. C. Woodfill, Arizona State University; **TIME SHARING DIAGNOSTIC TEST SYSTEM** by W. H. Hoard, IBM Corp., Systems manufacturing Divn.; **DIGITAL SYSTEM DESIGN EDUCATION AT ARIZONA STATE UNIVERSITY** by M. C. Woodfill, Dept. of EE, Arizona State University; and **THE BIOLOGICAL INERTIAL SYSTEM** by Robert Mayne, Arizona State University.

**SOLID STATE RESOURCES Session III-C** – Fri., 1:45 p.m.; Chairman: James E. Soloman, Motorola Integrated Circuits Center. **NOISE IN INTEGRATED OPERATIONAL AMPLIFIERS** by A. J. Brodersen, E. R. Chenette, and R. C. Jaeger, University of Florida, Dept. of EE; **ONE-NANOSECOND CURRENT MODE LOGIC CIRCUITS** by J. A. Narud, Charles S. Meyer, and David K. Lynn, Motorola Semiconductor Products Divn.; **COMPUTER-AIDED ANALYSIS FOR INTEGRATED CIRCUITS** by J. A. Narud, Motorola Semiconductor Products Divn., and Michael L. Dertouzos, Massachusetts Institute of Technology; **TESTING OF MSI-LSI INTEGRATED CIRCUITS** by Dr. Frederick J. Hill, University of Arizona, and Charles S. Meyer, Motorola Integrated Circuits Center; **GENERATION AND PROPAGATION OF SURFACE ACOUSTIC WAVES** by D. E. Allen, F. S. Hickernell, and K. C. Wolters, Motorola Government Electronics Divn.; and **SOL-**

Continued on page 11



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# Experience in Operating Pacific Northwest-Southwest 500kv Intertie

The next meeting of the Power Chapter will be on Tuesday, April 8. The speaker, E. F. Kaprielian, will discuss "Experience in Operating The Pacific Northwest-Southwest 500 KV Intertie." The San Francisco IEEE Section Power Group has been fortunate to have had several informative programs during the past several years dealing with the Pacific Northwest-Southwest 500 kv Intertie System. These programs presented by Pacific Gas and Electric Company engineers have dealt with subjects focused toward the design, construction, and system study phases of the Intertie.

The two 500 kv a.c. lines and associated facilities comprising the a.c. portion of this EHV system have now been in service for over a year. In his role as Manager of Power Control for P. G. and E., the speaker has the responsibility for the Intertie's operation within the Company system. His talk will deal with operating criteria, experience with the performance of the major components of equipment, power scheduling over the EHV system, and some of the sophisticated tools being utilized to assist with its reliable operation. The talk will be supplemented with slides showing some of the completed Intertie facilities in the P. G. and E. System area.

E. F. Kaprielian also has the responsibility for the coordination of the hydro-electric production of numerous public agencies in Northern and Southern California. He is a Senior Member of the IEEE and a member of the San Francisco Power Group. He received his B.E. degree in electrical engineering



E. F. Kaprielian

from the University of Southern California in 1942.

While engineers and construction men were engaged in the design and construction of the 500 kv Pacific Intertie System and its related facilities, Kaprielian and his operating counterparts representing other Pacific Intertie Systems have been at work planning for the day when the Intertie System was to become the backbone transmission system along the Pacific slope. In addition to participating as a member of the Pacific Intertie Operations Task Force, Kaprielian represents P. G. and E. on the Engineering and Operating Committee of the California Power Pool as an alternate Member of the California Power Pool Board of Control, and he is one of two California representatives on the North American Power Systems Interconnection Committee (NAPSIC).

The 7:30 meeting at the Engineers Club will be preceded by cocktails and dinner. For further information see the Calendar.



The picture shows a section of the P.G.&E. Tesla Substation, located near Tracy.

# The Apollo 12 Lunar Surface Magnetometer

The April meeting of the Aerospace and Electronic Systems group will feature a talk on the Apollo 12 Lunar Surface Magnetometer, by Dr. Palmer Dyal of the NASA/Ames Research Laboratory. The lunar surface magnetometer is an instrument used as part of the Apollo Lunar Surface exploratory package to measure the magnetic field on the surface of the moon. These measurements will be used to determine some of the deep electrical properties of the moon and to help elucidate solar plasma-lunar interaction.

The experiment is self-contained and has a mechanical and thermal subsystem which will allow operation for a minimum period of one year on the lunar surface. After deployment by the astronaut, the instrument sends back magnetic field data, temperature data, voltage data, and orientation information at a rate of three times per second for the one-year period.



Dr. Dyal

Dr. Dyal, Research Scientist at Nasa/Ames, has been conducting research on planetary and interplanetary magnetic fields for the past three years. Prior to that he directed research in the measurement and interpretation of nuclear burst phenomenon in space for the Air Force Weapons Laboratory. Dr. Dyal received the Ph.D. from the University of Illinois in 1959. He is a member of the American Physical Society and the American Geophysical Union. Dr. Dyal will supplement his talk with slides and a model of the unit, plus a short movie on how the unit will be deployed by the astronaut.

The meeting will be held at 8:00 p.m., April 24, in the Lockheed Auditorium, 3251 Hanover Street, Palo Alto. No dinner. Elections for A and ES officers for the coming year will also be held. Members, their guests, and the general public are invited to attend.



## Historical View of Bay Area Electronics

On Saturday morning, April 26, the Education Chapter will enjoy hearing a discussion on the history of electronics in the Bay Area, and the development of the Douglas Perham Foundation Electronic Museum at Foothill College. An occasional "backward look" is often helpful in looking into the future, and too know "where we are going."

The talk will be given by Earl Goddard, Chairman of IEEE Historical Committee and a member of the Board of Directors of the Perham Foundation. There will be photos, some electronic exhibits and tape recordings of interviews with some of the early Bay Area electronic pioneers.

The location is Cogswell Polytechnical College in San Francisco. Coffee and doughnuts will be served at 9:30 a.m. preceding the meeting. See calendar.



E. Goddard

Museum



## Information Theory Guests Kung Yao

The Information Theory Chapter meeting, Thursday, April 17, will feature Prof. K. Yao as its speaker, who will discuss Translation Invariant Subspaces and Filtering Problems. The translation invariant Hilbert space technique plays a fundamental role in filtering and prediction problems of wide sense stationary stochastic processes. The original works of Wold, Kolmogorov, Helson and Lowdenslager, and others all utilized this technique. The



Prof. Yao

classical communication engineering deterministic signal filtering problem has a simple and elegant explanation in terms of the results of double translation invariant Hilbert space. From abstract isometric flow point of view, there is a simple relationship between the classical deterministic signal filtering problem and the Kolmogorov-Wiener filtering problem. Other results related to the works of Moeller in simple translation invariant Hilbert space are also given.

Kung Yao received the B.S.E. degree, the M.A. degree, and the Ph.D. degree in electrical engineering from Princeton University. While attending Princeton, he held a Princeton Engineering Predoctoral Fellowship, and an IBM Fellowship. While working on his doctoral thesis, he held a Research Assistantship. In 1965-1966, he was a NAS-NRC Postdoctoral Research Fellow at the University of California, Berkeley. Since September of 1966, he has been an Assistant Professor of Engineering at UCLA.

Dr. Yao is a member of Phi Beta Kappa, Sigma Xi, AAAS, and the IEEE. His principle interests are in communication theory and stochastic processes.

The 8:30 p.m. meeting will be held at SRI, Conference Room B, Bldg. No. 1, preceded by dinner at Ming's of Palo Alto at 6:15 p.m. Reservations. See Calendar.

## Computer Simulation of the HF Sky Waves

Recent studies of ionospheric radio propagation have led to the development of methods for simulating radio systems by digital computer. It is now practical to track the progress of radio rays with a high degree of realism; we have reached the state where the primary limitation is the lack of ionospheric structural data. Dr. Thomas A. Croft will describe the present state of this art at the April 10, 1969 meeting of the Antennas and Propagation group. The method has been used to simulate complete sounder systems in hypothetical circumstances, a process which sometimes leads to explanations of puzzling features found in real data. Two examples of such discoveries will be illustrated. (The talk is illustrated by motion pictures.)



T. A. Croft

Dr. Croft received the M.S. degree from Dartmouth College in 1954, flew in the Navy for 3 years and subsequently worked at Convair-Astronautics. He returned to school for a Ph.D. which was awarded by Stanford in 1965 and has since worked on the research staff at Stanford.

## NEW MEMBERS

### The Section

Welcomes these new members

W. K. Anderson	R. J. Penny
E. G. Breeze	C. G. Schwender
P. L. De Weese	W. A. Stimson
G. W. E. Emerson	R. L. Swearingen
R. T. Gill	J. S. Takeuchi
R. W. Hansen	R. R. Tipton
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## Circuit Theory Presents Alan Grebene on Integrated Circuits

The speaker at the Wednesday, April 16 meeting of the Circuit Theory Group will be Alan B. Grebene, Senior Member of Technical Staff, Signetics Corporation, Sunnyvale, California. He will discuss Frequency Selective Integrated Circuits Using Phase-Lock Techniques. The design method utilizes the interference rejection properties of the Phase-Locked Loop (PLL) to obtain the desired tuning characteristics. Phase-lock techniques do not require a tight control of absolute value tolerances, and offer a higher frequency capability than the active-RC synthesis techniques.

Several design examples will be given to demonstrate the feasibility of phase-locked integrated circuits in consumer electronics; and their potential in the communications field will be described.

Dr. Grebene obtained his B.S.E.E. degree from Robert College, Istanbul, Turkey, in 1961, his M.S.E.E. from the University of California at Berkeley, in 1963, and his Ph.D. from Rensselaer Polytechnic Institute, Troy, New York, in 1968.

During 1963 and 1964, he was employed as an integrated circuit research engineer at Fairchild Semiconductor Research and Development Laboratories, at Palo Alto, California. From 1964 through 1965, he was a member of the technical staff at the Microelectronics Division of the Sprague Electric Com-



A. B. Grebene

pany, North Adams, Massachusetts. During 1965 through 1967 he was a member of the electrical engineering faculty at R.P.I. in Troy, New York. He is presently involved in the design and development of linear integrated circuits for communication systems. He has authored a number of papers and holds several U.S. patents in the fields of solid state devices and integrated circuits. He is also a lecturer at the University of Santa Clara.

Dr. Grebene is a member of the IEEE, Sigma Xi, Eta Kappa Nu, the American Society for Advancement of Science, and the American Society for Engineering Education.

The meeting is scheduled for 8:00 p.m. at 134 McCullough, Stanford, with a 6:00 p.m. dinner at Ming's. Reservations. See calendar for all details.

## Com-Tech on Underwater Communications

Dr. Leon Camp of the University of California at Los Angeles will be the speaker at the Communication Technology Chapter's next meeting, April 16, 1969, at 8:00 p.m. In his talk, "Underwater Communications," he will present the differences between transmission as most of us understand it today with how it is accomplished under water. He will cover relative propagation velocities and losses for both acoustic and electromagnetic energy, peculiarities of transmission, typical types of available hardware and present types of systems in use. Since Sealab III enjoys widespread interest these days, some discussion of the frequency allocation plan and the systems it employs will be discussed.

The meeting will be held at Lockheed Auditorium, Bldg. 202, 3251 Hanover, Palo Alto and will be preceded by a no-host dinner and cocktails at Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto. Cocktails will be at 5:45 p.m.,



Dr. Camp

dinner at 6:15 p.m. For dinner reservations only call Milt Seymour (415) 593-8491 or Paul Ahern (408) 291-4415 by April 15, 1969.

The chapter wants to thank all of you for coming to our symposium on Communications Technology. Our meeting was quite well received by the 120 people who attended. We're sorry more couldn't participate, but we hope the response will be greater at next year's symposium. Watch the Grid for further details late this year.



# Industry & General Applications Chapter Features Two Speakers

In recent years the KVA rating of power center transformers having low voltage secondaries has increased with the growing demand for power in commercial and industrial plants. These large transformers permit higher short circuit currents which must be withstood and interrupted by downstream apparatus. This subject will be discussed at the April 17 meeting of the Industry & General Applications chapter.



S.S. Browne J.C. Wilson

Stanley S. Browne is Plant Consulting Engineer, General Control Division, Westinghouse Electric Corp., Chicago. Mr. Browne received his EE degree at Virginia Polytechnic Institute. He joined Westinghouse, Switchgear Division in 1940 following five years with The Bureau of Reclamation as design engineer for control and relaying switchboards at Hoover Power Plant. During World War II Mr. Browne was loaned to

the Bureau of Ships, handling switchboards for all vessels and power generation and distribution on all battleships, carriers and cruisers. Since 1947 Mr. Browne has been associated with the design, development and application of control centers for Westinghouse.

James C. Wilson received his EE degree from Pennsylvania State University. He joined Westinghouse in 1961 as Circuit Breaker Design and Development Engineer following several years in the U.S. Army with the Signal Corps. His present job responsibilities include development of molded case circuit breakers for high current interruption performance, improving withstand capability of non-automatic disconnect switches and design of current limiting fuses.

Both men are well qualified to discuss this subject. Their talk will present some general guidelines in the selection and application of protective devices for primary feeders and motor control centers. They will also clarify the terms used in the evaluation of short circuit currents.

The meeting is called for 7:30 p.m. at Insurance Securities Building, San Francisco, with dinner being served at 6:30 p.m. Reservations. See calendar for details.

## State Exam Review

A weekly evening review for those preparing for the State's Professional Mechanical Engineer's Examination will be given during the next three months at the University of Santa Clara.

Sessions will be conducted Wednesday evenings, March 19 to June 18, from 7 to 9 p.m., in Sullivan Engineering Center on the campus.

Instructing will be members of the mechanical engineering department faculty, each reviewing in his area of specialty. Department Chairman Richard K. Pefley is the coordinator.

For further information, please contact the University, 246-3200, Ext. 228.

## S.W. IEEE Conference

On April 23-25, 1969, the 21st Annual Southwestern IEEE Conference and Exhibition will be held at the San Antonio Convention and Exhibition Center. Contact William E. Cory, general chairman, Southwest Research Institute, Box 2296, San Antonio, Texas 78206 for further information.

## Commendation for Donald Fink

Donald G. Fink has been voted special commendation for professional services by the Executive Committee of the IEEE. Mr. Fink, who is General Manager of IEEE, was recognized for his work as Editor-in-Chief of THE STANDARD HANDBOOK FOR ELECTRICAL ENGINEERS, Tenth Edition, McGraw Hill Book Company, 1968. The Handbook, previously edited by the late Archer E. Knowlton, has been an indispensable basic reference source for 61 years. Mr. Fink was a major contributor to previous editions and is the author of many technical books.

Of special importance in his work was providing for the increasing impact of electronic methods and components in the field of electric power. Much new material has consequently been added in such fields as data processing and transmission, control instrumentation, nuclear generation, high voltage d-c transmission, high power semiconductor devices and the control of interconnected power systems.

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## Hybrid Electric Vehicle Drives

High starting torques, required for acceleration of vehicles, are provided as inverse functions of synchronous speed by constant horsepower multispeed induction squirrel cage 3-phase motors, as high efficiency direct drives per traction wheel. The Ford Motor Company on November 19, 1968, tested the "Autolite Lead Wedge" at 138.862 miles per hour over the measured mile, on Bonneville Salt Flats, Utah. Recently electric cars raced across the continent. This will be the subject discussed by Mr. Paul Edison Pulliam at the April 21 meeting of the Vehicular Technology Chapter.

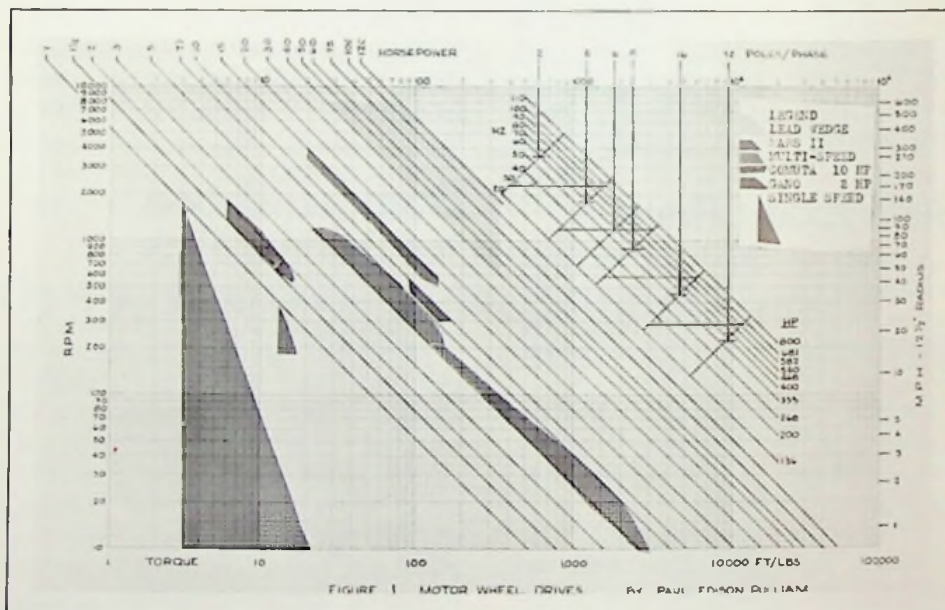
Mr. Pulliam received his B.S.E. E. degree from University of Missouri-Columbia in 1951. In Las Vegas, Nevada, he was mechanical engineer plant checker for Clark County building and safety department, jurisdiction of which included the Las Vegas strip. He is a retired reserve Major of Artillery. In 1952, in Little Rock, Arkansas, he provided design criteria for atomic-powered submarines and named the Polaris weapon system. In Lansing Michigan, on May 12, 1960, he specified the use of eight nuclear reactors and four propellers re-



Mr. Pulliam

spectively in pairs fore and aft, and designed criteria for the nuclear-powered aircraft carrier Enterprise. Mr. Pulliam has been with Ampex Corp. for 2½ years as EE in plant facilities, Redwood City complex.

The meeting, cocktails, and dinner will be held at the Golden Steer Restaurant in Redwood City. See calendar.



## Ultimate Limitations for Intelligent Machines?

At the May 1 meeting of the Systems Science and Cybernetics chapter, a distinguished panel will consider the philosophical and scientific aspects of the question: What are the ultimate limitations for intelligent machines? Panel members include Prof. John McCarthy (Stanford University), Dr. Louis Fein (Consultant), and Dr. Stephen Coles (Stanford Research Institute). Panel moderator will be Prof. Michael Arbib

(Stanford University).

The Thursday meeting will be held at 8:00 p.m. at Stanford Research Institute, Main Conference Room, Bldg. 944, 333 Ravenswood Ave., Menlo Park. It will be preceded by a 6:00 p.m. dinner at the Coach and Six (formerly Stone Cellar), 1906 El Camino Real, Menlo Park. Reservations can be made by contacting Marge Hensley, 246-4642, by April 30, 1969.



# Decision Analysis: Theory and Practice



Mr. Howard

Recent developments in the field of analytical, logical decision-making are now being applied to some of the important decisions of industry and government. Decision Analysis: Theory and Practice will be discussed by Ronald A. Howard at the Thursday, April 10, 1969, meeting of the Systems Science and Cybernetics Chapter. This presentation will describe how this new field of decision analysis treats the problems of encoding uncertainties, assigning values,

and establishing time and risk preferences within a logical framework that captures complexity and dynamic evolution. The practice of the field will be illustrated by a variety of examples involving major decisions in both private and public sectors of the economy.

Ronald A. Howard is Prof. of Engineering-Economic Systems in the Dept. of Engineering-Economic Systems at Stanford University. He also holds Stanford appointments as Prof. of Management Science in the Graduate School of Business and Prof. of Decision Science in the Dept. of Operations Research.

Prof. Howard is the author of the book DYNAMIC PROGRAMMING AND MARKOV PROCESSES, as well as of papers, chapters, and articles on decision analysis, probabilistic modeling, and operational systems. He is a senior member of IEEE and is a member of other professional and honorary societies. Prof. Howard is currently serving as Editor of MANAGEMENT SCIENCE, Associate Editor of OPERATIONS RESEARCH, and is a series editor for John Wiley & Sons, Inc. He is Past President and Chairman of the Council of The Institute of Management Sciences.

The 8:00 p.m. meeting, which will be held in Conference Room B at Stanford Research Institute is also an election meeting. There will be a dinner at 6:00 p.m., Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto. Phone Marge Hensley, 246-4642, by April 9, 1969, for reservations.

## Region 6 Conference Continued

DIGITAL STATE DIGITAL CONTROL TRANSFORMER by D. R. Berickner and B. K. Swift, Sperry Flight Systems Divn.

ANALYTICAL RESOURCES Session III-D - Fri., 1:45 p.m.; Chairman: Dr. Paul Russell, Arizona State University. SAMPLING OF FUNCTIONS OF TWO VARIABLES IN FOURIER OPTICS by I. D. Tripathi, University of Houston; A. SPECTRAL DENSITY APPROACH TO NOISE PERFORMANCE CALCULATIONS by John Choma, Jr., Dept. of EE, University of Pittsburgh; DETECTION OF UNDERWATER SIGNALS BY NON-PARAMETRIC TECHNIQUES by Daniel Schutzer and Philip Lipsky, Sperry Systems Management Divn.; STATE VARIABLE FEEDBACK FOR THE DIGITAL CONTROL OF MULTIVARIABLE SYSTEMS by Donald G. Mudd, San Diego State College; and STATE VARIABLE FEEDBACK AND NONLINEAR SYSTEM SYNTHESIS by J. W. Herring, Jr., Mississippi State University and D. G. Schultz, University of Arizona.

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## The Cache Concept

Design objectives for a high-speed digital processor often include both fast instruction processing and large quantities of main memory. The design of such a processor presents a paradox in that large main memory implies large physical size; while large physical size implies slow access time. The cache concept is a nanosecond/microsecond level of storage hierarchy which has been employed on the IBM System/360 Model 85 as a solution to this paradox. This topic will be discussed at the Tuesday, April 22 meeting of the Computer chapter with Donald H. Gibson as the speaker. Model 85 cache has been developed through the use of simulation. This simulation was based upon a wide range of customers' System/360 applications and upon the use of basic engineering working documents for timing these applications against over one hundred different implementations of a cache memory hierarchy. The final selection employed in the Model 85 was chosen with knowledge and understanding of the trade-offs involved. These trade-offs provide an interesting basis for speculation on future developments.



D. H. Gibson

Mr. Gibson earned the Bachelor's Degree in Electrical Engineering at the University of Kentucky. He was employed by IBM as a system engineer on the SAGE project, where he specialized in CPU and Memory design.

Mr. Gibson attended IBM's System Research Institute. Upon graduation, he conducted a survey of Scientific Computing in the Aerospace Industry. The requirements defined in this survey were impetus to the design of the 360/91.

In 1966, Mr. Gibson assumed the position of Design Support Manager for Large Systems at IBM, Poughkeepsie, N.Y. His work with the system structure of the Model 85, and in particular with the buffer design, was recognized in 1968 with the presentation of the Outstanding Contribution Award of IBM.

The meeting is scheduled for 8:00 p.m. in Room 134, McCullough Bldg., Stanford. Dinner location (6:15 p.m.) is Rick's Swiss Chalet. Reservations. See Calendar.

## Dover Joins Data Memory



Jerome J. Dover, has joined Data Memory, Inc. (Mountain View, Calif.), as executive vice-president.

Jerome J. Dover, former general manager of the Special Products Division of Ampex Corporation, has joined Data Memory, Inc. as executive vice-president.

Prior to his ten years at Ampex, Dover held scientific and management positions with the U.S. Air Force and the National Bureau of Standards. A physics graduate of Grinnell College, Iowa, he is a senior member of both the Institute of Electrical and Electronics Engineers and the Instrument Society of America.

Data Memory, Inc. is a recently formed multi-million-dollar manufacturer of magnetic disc recording systems and Videodisc\* recorders.

\*Trademark

## Call For Papers

A SPECIAL ISSUE OF THE IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES is planned for publication towards the end of 1969. The title of the issue will be "Microwave Acoustics." Theoretical and/or experimental papers are invited for this special issue. The purpose of this special issue is not only to acquaint the microwave engineering community with the state of the art in microwave acoustics, but also to stimulate its interest in contributing to the solution of the many problems that are arising in this rapidly expanding field. Therefore, it is planned to invite the submission of several survey or tutorial articles that will be written specifically with the microwave engineer in mind. Contributed articles of this type will also be considered for publication. The deadline for submission of three complete manuscripts for review is June 2, 1969. Communications and papers should be directed to Dr. A. J. Bahr, Guest Editor, Stanford Research Institute, 333 Ravenswood Avenue, Menlo Park, 94025.

The 1969 NUCLEAR SCIENCE SYMPOSIUM will be held October 29, 30, and 31, 1969, at the Sheraton Palace Hotel, San Francisco. Contributed papers are desired on the following subjects: Nuclear Science Instrumentation and Systems for Medicine, Biology, and Environmental Sciences; Nuclear Power-Instrumentation, Control, Operations, and Standards; Nuclear Data Acquisition, Handling, and Control Systems; Nuclear Instrumentation for Laboratory and Industrial Uses; Nuclear Instrumentation for Research and Use in

Oceanography, Space and Geophysics; and Nuclear Radiation Detectors. The Abstract and Summary must be sent to the Program Chairman by June 15, 1969; Mr. R. C. Maninger L-121, Lawrence Radiation Laboratory, P.O. Box 808, Livermore, California 94550. All papers accepted for the Symposium will also be candidates for the Symposium issue of the IEEE Transactions on Nuclear Science subject to another review. It is not necessary to be an IEEE member to present a paper. Manuscripts of accepted papers must be prepared in IEEE format and must be submitted at the time of the Symposium.

The 1969 IEEE INTERNATIONAL SYMPOSIUM ON CIRCUIT THEORY will be held December 8-10, 1969, at the Mark Hopkins Hotel, San Francisco. The IEEE International Symposium on Circuit Theory features the presentation of original research papers and invited papers by researchers from both industry and universities. The Symposium provides a forum for discussion of topics in circuit and system theory. The theme which is to be continued is that of work at the interface between theory and practice. Of course high quality papers from throughout the broad spectrum of the field are to be welcomed as always. Deadline for submission of papers is July 1, 1969. The Technical Program Chairman will notify authors of accepted symposium papers by October 1, 1969. All manuscripts are to be submitted directly to the editor, IEEE Transactions on Circuit Theory: Professor B. J. Leon, School of Electrical Engineering, Cornell University, Ithaca, New York 14850.



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built-in battery recharger weighs 30 pounds including accessories and batteries and operates from an internal 24-volt rechargeable battery pack; from 115 or 230 VAC  $\pm 20\%$ , 45 to 440 Hz, 27 watts; or from 11.5 to 35 VDC, 23 watts.

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# Joint Sponsors for COMSAT Tour

On Saturday, April 26, 1969, the Santa Clara Valley Subsection and the U.S. Naval Postgraduate School Student Branch will jointly sponsor a tour of COMSAT's and Bell System's Satellite Earth Station at Jamesburg, California in Carmel Valley. After the field trip the Student Branch will host a cocktail hour and dinner in the El Prado Room of the Naval Officers' Club in Monterey.

COMSAT's Jamesburg Station is the newest Earth Station on the West Coast. It has just become fully operational. COMSAT owns and operates the earth antenna and satellite link terminal equipment. The Bell System owns and operates earth link terminal equipment in the same building.



A.T.&T. Long Lines earth link terminal equipment in the earth station at Jamesburg, California in Carmel Valley. This equipment connects overseas satellite circuits to a six-hop microwave system which joins the Bell System's national network in the Bay Area. Workmen in the picture are equipment installers.

The antenna was built by Philco-Ford Corporation's Western Development Laboratories in Palo Alto and is one of four recently installed — the others are in Puerto Rico, Hawaii and West Virginia. These new antennae, 97 feet in diameter, have an antenna figure of merit which Philco-Ford says is 15% greater than that of any communica-

tions satellite earth station up to now. Each of these new antennae had special requirements — for example, for the Jamesburg station, Philco-Ford had to submit "an earthquake analysis which demonstrates that the antenna meets the requirements of the California Code." The antenna dish is a solid aluminum surface supported on an elevation over azimuth type mount which is supported in turn by a two-story concrete pedestal. A "wind spoiler" mounted on the reflector's rim spoils the aerodynamic lift.

Manufacturing tolerance of the reflector surface has been measured at 0.015 rms. When the wind and gravity effects are added, the reflector contour is expected to be within 0.040 inches of the ideal design surface. The radio receiver and amplifiers for the satellite link are located in an equipment chamber which moves with the antenna. The rest of the satellite link terminal equipment is located in a building adjacent to the antenna structure.

In the same building with the COMSAT terminal equipment, A.T. & T. Long Lines operates terminal equipment for the earth link. From Jamesburg, transmission is via video cable for about 2½ miles and thence via a six-hop microwave system through Pacific Telephone stations in Salinas, Loma Prieta and Woodside to San Francisco and Oakland. Television transmission enters the Bell System's national network in San Francisco while message and other services join the network in Oakland.

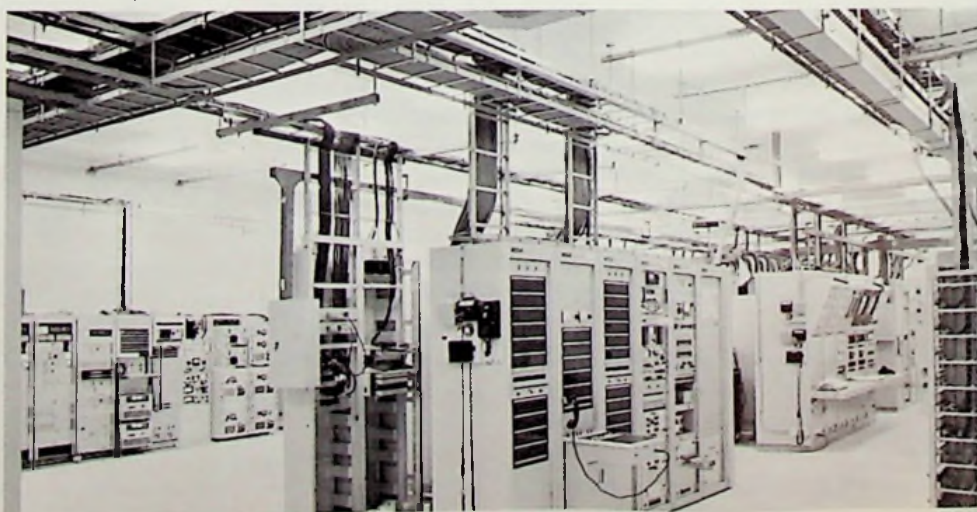
Microwave equipment for the earth link was manufactured by Collins Radio Company and uses frequencies in the 6 GHz and 11 GHz bands. This is the first use of Collins' 11 GHz equipment for

commercial service. The Collins microwave equipment uses all solid state design except for traveling wave tubes in the final output stage. Each microwave hop consists of three beams — one for television, one for message circuits and one for protection. Early tests indicate that up to 1,200 voice grade channels can be accommodated on a message beam.

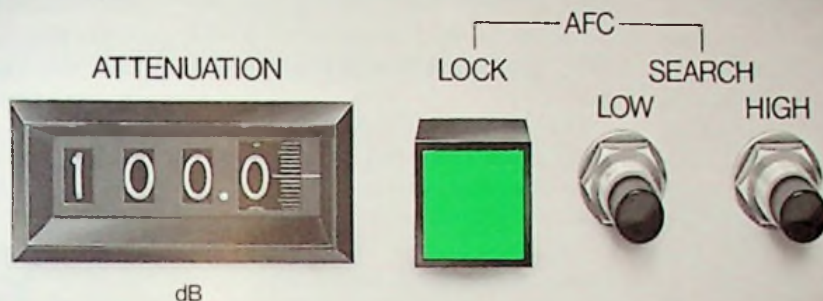
Present plans call for gathering at the Naval Postgraduate School (the Old Del Monte Hotel) in Monterey before 1:00 P.M. on April 26th. Transportation to and from the COMSAT Station — about thirty-five miles — will be provided by Navy busses which will depart at 1:00 P.M. sharp. Wives and guests who would like to visit the COMSAT Station are welcome; others may spend the afternoon on their own. A cocktail hour will commence in the Officers' Club after the busses return from COMSAT about 5:00 P.M. and dinner will follow at about 6:30 P.M. featuring roast beef at a price of \$4.75 per person. Dinner will be finished by about 9:00 P.M. and those who wish to return to the Bay Area may do so, although several people plan to stay overnight in motels in the Monterey area.

Reservations for the COMSAT tour and/or Officers' Club dinner will be required. They may be made by calling Mrs. Chris Montez in San Jose on 408-291-4014 or Lt. P. F. Grasser in Monterey at 408-646-2231. There is a limit to the number of people who can be accommodated and hence the need for reservations — first-come, first-served. Deadline for reservations will be 4:15 P.M. April 23rd (unless the tour and/or dinner become fully subscribed sooner).

COMSAT's satellite link terminal equipment in the earth station at Jamesburg, California in Carmel Valley.







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## Electroglas Appoints Engineering V. P.

The appointment of T. Roland Fredriksen as vice president, engineering, of Electroglas, Inc., Menlo Park, has been announced.

Mr. Fredriksen joined Electroglas in 1967, as electrical engineering manager, and became engineering manager in January 1968. Since this time he has been responsible for the development of a whole new product area, in the form of a unique line of digital automation systems.



Fredriksen

Before joining Electroglas, Mr. Fredriksen was with the IBM Corporation at Poughkeepsie and San Jose from 1962 to 1967, as senior design engineer, staff engineer, and advisory engineer.

Mr. Fredriksen is an expert, known nationally and internationally for his work on closed-loop control of stepping motors. Over the past few years his accomplishments include: 16 published papers and articles, 40 invention disclosures, 6 patent publications, and 4 patent applications currently on file. As a member of the San Francisco Section of IEEE, he has presented and published papers under their auspices.

## Space Radiation Challenges the MOSFET

Certain developmental trends in sophisticated solid-state devices are on a collision course with the unfolding technology of space radiation tolerance. Roy O. Lange, featured speaker at the April 21, 1969 EMC meeting, has previously discussed this topic at the 10th IEEE Symposium on EMC in Seattle, July, 1968.

The adoption of unipolar FET devices, while eliminating the problem of premature death of minority carriers, counters other space radiation considerations. The junction FET is a slow-acting device due to its large drain-to-gate feedback capacitance. The MOSFET exhibits threshold vagrancy as the result of mobile ions in its dielectric. The unijunction transistor is generally unsatisfactory under space radiation attack because it depends on resistive properties and is only lightly doped. Among bipolar devices, npn types are consistently better than pnp types due to lower resistivity of materials diffused with pentavalent dopants.

In the fabrication of IC's, epitaxial collector construction, though expensive, is essential to the maintenance of a low saturation voltage  $V_{CE(sat)}$ , which isolates the output from radiation-induced EMI at the base input. With the device pulled out of isolation spurious base signals may be amplified 1000 times at the collector. Germanium devices are particularly unstable under space radiation attack, generating in their depletion regions reverse currents 1000 times those generated in silicon devices. Isolation of transistors from each other is a requirement, to prevent latch-up. Epitaxial diffusion methods of isolation, developed to counter surface EMI effects, are unsatisfactory under space radiation attack, where the particles penetrate the diffusant lattice and destroy the isolation characteristics of the junction. Dielectric isolation, whereby each active component is surrounded by an  $SiO_2$  barrier, eliminates the diffusion area problem, but is an expensive process.

Space radiation induces EMI in solid-state devices and microelectronics typically by altering dopant concentration, trapping minority carriers, and generating depletion-region currents. These effects can be minimized by component selection and fabrication techniques. But first, the challenge must be understood.

Roy O. Lange, a member of IEEE, received the B.A. degree in economics and the L.L.B. degree from Columbia University, New York, N.Y., in 1947 and 1949, respectively. He then received the B.S. degree in electrical engineering from the University of Texas, El Paso, in 1958, and completed graduate work in mathematics at the State University of New Mexico, University Park.

After practicing in the fields of patent law and contracts he studied engineering, completing his graduate work while employed as an Electronics Engineer at the White Sands Missile Range, White Sands, New Mexico.



R. O. Lange

For the past two years he has been responsible for establishing criteria and preparing governing documentation on Space Radiation effects, on plastics and microelectronics in the Space Systems Division at Lockheed.

The meeting will be held in the Hewlett-Packard Auditorium, preceded by dinner at Rick's Swiss Chalet in Palo Alto. See calendar for complete details.

## Watkins Johnson Names New Division Manager

Dr. William E. Kunz has been named manager of the Solid State Divisions of Watkins-Johnson Co.

Dr. Kunz takes charge of one of the company's five major divisions. He has been with the company since early 1964 and until his new assignment was manager of the Space Communications and Telemetry Department of W-J's Systems Division.

He has B.S., M.S. and Ph.D. degrees in Electrical Engineering from the University of Illinois and worked as a research assistant in the Ultramicrowave Group of the Electrical Engineering Research Laboratory of the University.

He is a member of IEEE, San Francisco Section, Tau Beta Pi, Eta Kappa Nu, Sigma Tau, Phi Eta Sigma and Sigma Xi.

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Ph.D. Physics or EE desired. Five to ten years combined experience in theoretical and experimental studies related to scattering and propagation to include 3-4 years supervisory experience.

## PROCESSING ENGINEERING MANAGER

Manage Advanced Processing Systems Department of the Propagation Systems Laboratory. This department is responsible for developing signal processing techniques, developing and applying system simulation techniques, maintaining a processing facility, identifying systems requirements, designing systems, and for providing technical support for development and implementation of hardware and software for specific systems.

M.S., Ph.D., EE, Physics, or Applied Mathematics required. Five to ten years combined experience related to implementation of processing systems and systems design.

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### PROJECT MANAGEMENT

Provide technical leadership of projects ranging in size from small R&D projects through major avionics system developments.

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BS in EE or Physics, with MS desirable. 3 years' experience in surveillance and target acquisition systems required. Must have working knowledge, from a systems viewpoint, of 2 or more of the following sensors: LLLTV, FLIR, high resolution radar, laser rangefinder, IF line scanner.

## AIRBORNE MULTISENSOR

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BSEE/MSEE desired, with 3-6 years' experience in airborne avionics systems including airborne sensing means.

To arrange an interview-appointment at your convenience please call Mr. David Walsh at 966-2995 any time this week. If unavailable for an interview at this time please forward your resume in complete confidence to Mr. Walsh, P.O. Box 188, Mountain View, California 94040. U.S. Citizenship required. Sylvania is an equal opportunity employer.

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## Swanson Appointed Engineering Director

Advanced Microwave Labs of Sunnyvale announced the appointment of William E. Swanson as Director of Engineering. Mr. Swanson will direct research and development aimed at extensive product expansion as well as development of new generation RF components and subsystems.



Mr. Swanson

Prior to joining AMLABS, Mr. Swanson completed a seven-year tenure as professor of electrical engineering at San Jose State College also working as lecturer and consultant in the field of solid state electronics and semiconductor physics. Mr. Swanson's early experience includes research and development project assignments at the Sylvania Microwave Physics Laboratory and Microwave Device Division. He is a member of the IEEE, San Francisco Section.

## PML Names New V.P.

Peninsula Microwave Laboratories in Mountain View announced the appointment of Joe N. Neville as the new Vice President, Operations. This appointment is one which places the entire responsibility of Engineering & Manufacturing under one central Operational Managerial Control.

Mr. Neville was formerly with Melabs as an engineering group leader. Prior to that he was at Western Microwave Laboratories in Santa Clara, serving as manager of microwave component engineering.

Mr. Neville received his B.A. in Physics from San Jose State College. He also completed a management development program at the University of Santa Clara. He is a member of IEEE, San Francisco Section.

## Steinberg Elected V.P. of Ampex Corporation

Charles A. Steinberg, general manager of the Ampex Corporation Videofile Information Systems Division, has been elected vice president of the Corporation. Steinberg has been responsible for the company's Videofile system program since its beginning in 1965. The system combines television recording technology and computer techniques to automate document files.



C. A. Steinberg

Before joining Ampex, he was associated with Airborne Instruments Laboratory, Massachusetts Institute of Technology and Bell Telephone Laboratories.

Steinberg holds a Master of Science degree from MIT. He is a member of the American Management Association, Society for Information Display and Institute of Electrical and Electronics Engineers.

## Seminar on 'Getting to Know Microwave Transistors Better'

The Microwave Theory & Techniques chapter will hold a two-session seminar April 10, 1969, with dinner served. The theme of the afternoon and evening sessions is "Knowing Microwave Transistors Better." The seminar location will be the SLAC Auditorium.

Speakers from six different organizations will discuss topics of current interest to circuit designers, system designers, and other transistor users. The topics to be discussed include the following: (1) State-of-the-art of transistors for high power devices, low-noise amplifiers, broadband amplifiers, stable sources, and other special applications; (2) The relationship between observed "black-box" transistor parameters and physical transistor parameters; (3) How do transistor fabricators choose the physical parameters of a transistor to yield special purpose devices for high power, low noise, and for integrated circuit application?; (4) Using physical and "black-box" transistor parameters to design sources, amplifiers, and other special devices.

Registration and detailed program information to be announced in circular. See calendar for registration details.

## EBSS Sponsors Science Paper Contest

A \$500 scholarship will be awarded to the winner of the EAST BAY HIGH SCHOOL SCIENCE PAPER CONTEST. First and second runners-up will receive a prize of a \$50 United States Savings Bond. This contest is sponsored by the East Bay Subsection and is open to all High School students in Alameda and Contra Costa Counties. The final date for submittal of papers is April 20, 1969.

The purpose of this contest is to promote interest in science and engineering among High School students. The papers may be written on any subject in the applied sciences or engineering.

In the past, the first prize award has never been more than \$100. Due to the generosity of certain East Bay firms, the award has been raised to \$500 this year. This award will be payable upon enrollment in a College or University. Members of IEEE are urged to inform any eligible students they may know, of this opportunity.

For further information on the contest, please contact the following: (1) Jerry Bills, (Kaiser Aluminum) No. 8 Olney Court, Danville; business phone: 569-2012. (2) Fred Doell, (Pacific Telephone) 10912 Cotter St., Oakland; business phone: 399-4974. (3) Jean Helmke, (Section office) 327-6622. (4) Bob Nannizzi, (Bechtel Corp.) 441 Whitehill Road, Alameda; business phone: 764-7729.

The dinner and meeting at which the contest finalists will present their papers and awards will be given, is tentatively scheduled for Monday, May 5th. See May Grid for details.

## NTC '69 Exposition to Feature Dynamic Displays

The IEEE National Telemetry Conference and Exposition (NTC '69), to be held in Washington, D.C., April 22-24, 1969, will focus special attention on the Exposition by providing a close tie-in between the exhibits and the technical program. Arrangements are being made to transform the Washington Hilton Hotel, NTC '69 headquarters into an international telemetry, data and communications center. This annual meeting is co-sponsored by the IEEE Groups on Aerospace and Electronic Systems and Communications Technology.





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### ADVERTISER/AGENCY INDEX

Airborne Instruments Laboratory ..	15
(Campbell-Mithun, Inc.)	
Applied Technology Inc. .	Inside Front
(R. G. Williams Co.)	
Bechtel Corporation .....	20
(Conley, Baker & Steward)	
Calvert Electronics International, Inc.	10
Englert and Company .....	3
Fairchild .....	5
(Coakley-Heagerty, Inc.)	
Louis Feldner .....	20
John Fluke Mfg. Co. ....	8
(Bonfield Associates, Inc.)	
General Devices, Inc. ....	10
Halted Specialties Company .....	20
Kaiser Aerospace .....	19
(Coakley-Heagerty, Inc.)	
LectroMagnetics .....	16
(Van der Boom, McCarron, Inc.)	
Melcor Electronics .....	11
(Samuel H. Goldstein)	
Neely Sales, Div. HP Co. ....	1
Raytheon Company .....	Inside Back
(Hoag & Provandie, Inc.)	
Stanford Research Institute .....	9
(Sobel Advertising)	
Sylvania .....	17
(Hal Lawrence)	
Tektronix, Inc. ....	13
(Dawson, Turner & Jenkins, Inc.)	
Wanlass Electric Company .	Back Cover
(William E. Wilson Co.)	
Western Gold & Platinum .....	9
(Hal Lawrence, Inc.)	

## Manufacturer/Representative Index

Aerotech ..... Jay Stone & Assoc.  
Anadex Instruments ..... Jay Stone & Assoc.  
Applied Dynamics, Inc. .... J. D. Kennedy Co.  
Applied Microwave Laboratories ..... Jay Stone

Ballantine Operation,  
Singer Co. .... T. Louis Snitzer  
Basler Electric Co. .... Abbott Engineering Co.  
Beckman Instruments, E.I.D. . O'Halloran Assoc.  
Boonton Electronics Corp. .... O'Halloran Assoc.  
Business Information Tec. . T. Louis Snitzer Co.

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Walter Associates  
"The Village Corner"  
P.O. Box AN  
Los Altos; 941-3141

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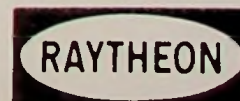
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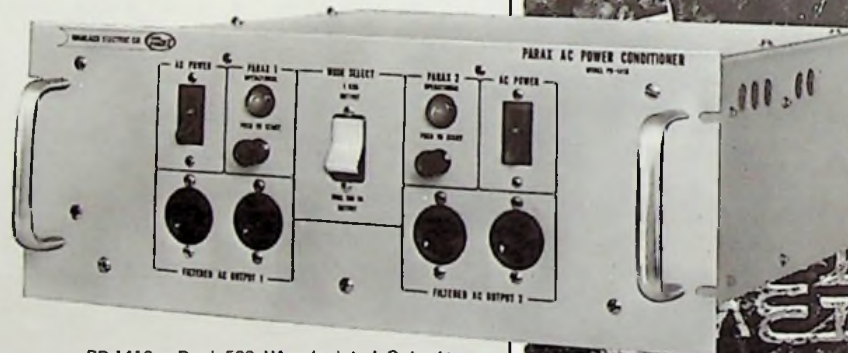
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