

# EDITOR'S PROFILE of this issue

*from a historical perspective ...*

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

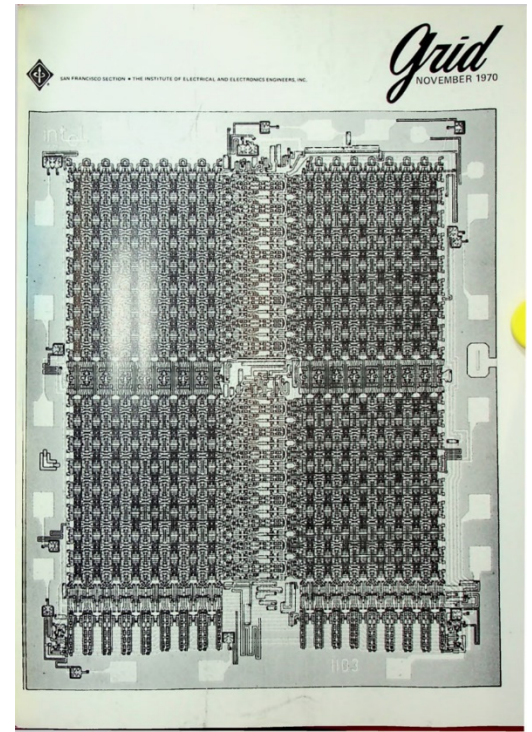
November, 1970:

Cover: Shown is Intel's famous 1103 Dynamic Random Access Memory (DRAM), with 1,204 memory cells. It used an 8-micron pMOS process and was packaged in an 18-pin dual in-line (DIP) package. I remember testing these when I was at Braegan Systems.

Page 8: Fred Terman, now retired from his position as Provost of Stanford, speaks on scientific and engineering employment – surplus or shortage. He had been consulting for several national groups, including some New Jersey companies and for SMU in Texas. His completed studies are available in the Terman Engineering Library at Stanford.

Page 12: A group of key technologists looks at the future of the various MOS technologies. Floyd Kvasme of National Semiconductor and Gordon Moore of Intel are on the panel.

Page 13: As defense contracts are cut back and unemployment picks up in this recession, a panel discusses what the future holds.



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

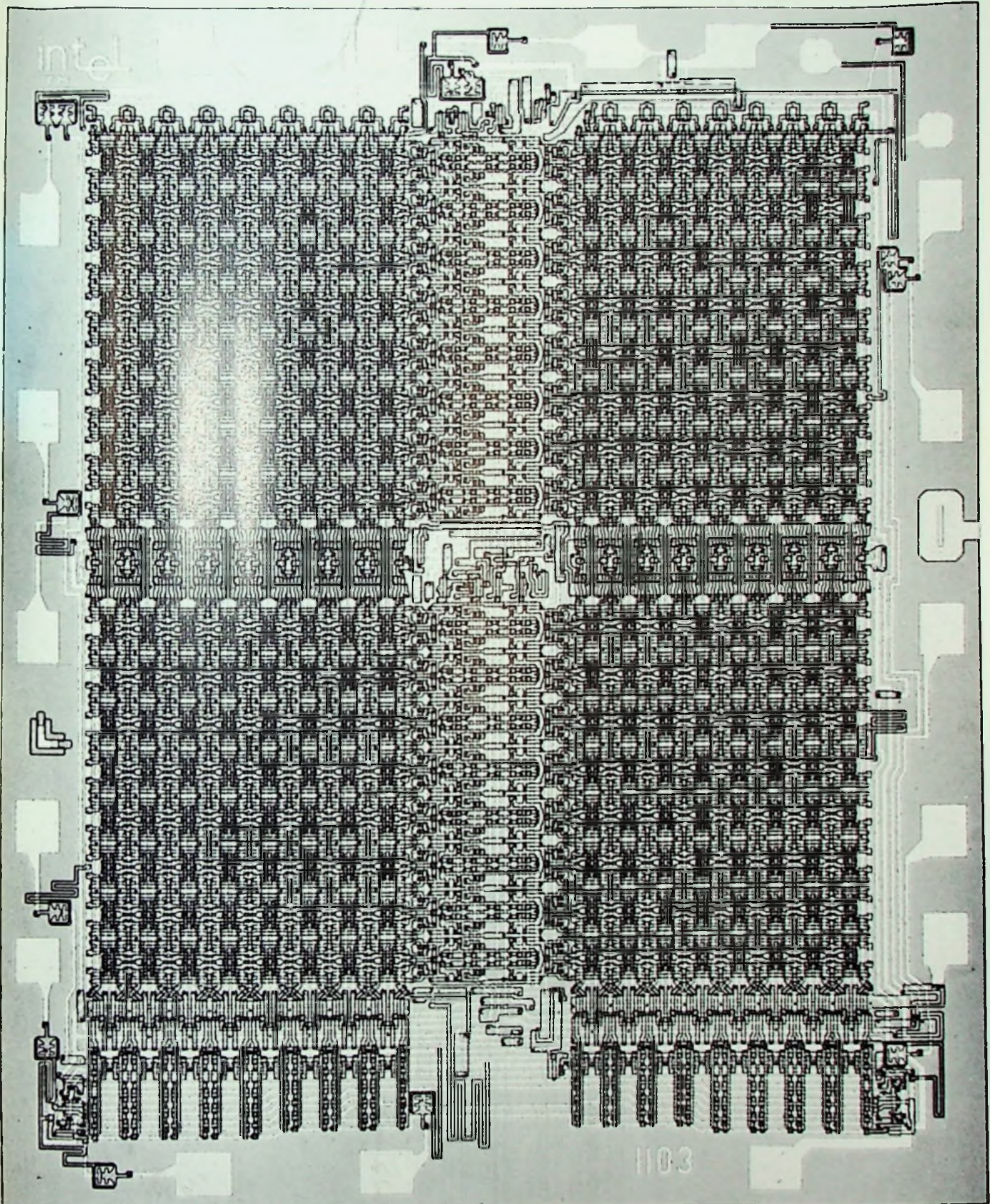
Contact [p.wesling@ieee.org](mailto:p.wesling@ieee.org)





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*Grid*  
NOVEMBER 1970







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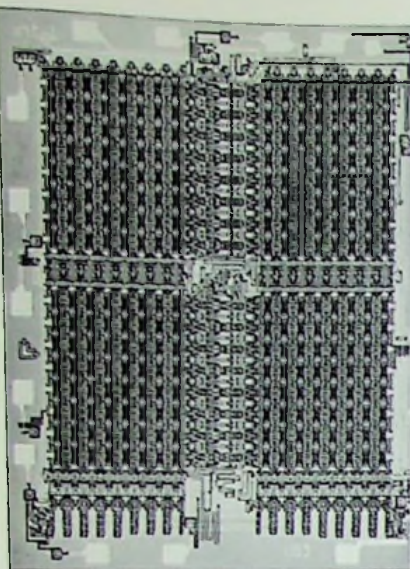
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# meeting



## ON THE COVER

High complexity MOS integrated circuit fabricated using silicon gate technology. Electron devices chapter will feature a panel of distinguished engineers and scientists from companies prominent in the production of MOS integrated circuits. Story on Page 12.

*Grid*

volume 17  
number 3

NOVEMBER 1970

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**AEROSPACE &  
ELECTRONIC  
SYSTEMS**  
NOV. 19

Story on  
page 10

**ULTRA-HIGH SPEED DATA COMMUNICATIONS -  
THE NEW FRONTIER.** An illustrated lecture by C. Louis  
Cuccia, Manager, R.F. Systems Dept., Philco-Ford, Palo  
Alto.

NOV. 19, Thursday, 8:00 PM, Philco Ford Auditorium, Bldg. 56, 3825 Fabian Way, Palo  
Alto. Dinner: 6:15 PM, Rickey's Hyatt House, 4219 El Camino, Palo Alto. Reservations:  
Pat Hoppe, (415) 326-4350, ext. 6143 by Nov. 16th.

**ANTENNAS &  
PROPAGATION**  
NOV. 18

Story on  
page 6

**WIDEBAND MONOPULSE DIRECTION FINDING  
TECHNIQUES.** Louis G. Bullock, Sylvania Electronic  
Systems-West.

NOV. 18, Wednesday, 8:00 PM, Lockheed Research Lab Auditorium, Bldg. 202, 3251  
Hanover St., Palo Alto. Cocktail hour 5:30 PM, dinner 6:15 PM, Rick's Swiss Chalet, 4085  
El Camino Way, Palo Alto. No reservations.

**AUTOMATIC  
CONTROL**  
NOV. 17

Story on  
page 11

**AIR QUALITY PREDICTION AND CONTROL SYS-  
TEMS FOR INDUSTRY.** Dr. Charles H. Wells, Manager,  
Process Control Div., Systems Control, Inc., Palo Alto.

NOV. 17, Tuesday, 8:00 PM, Lockheed Auditorium, Bldg. 202, 3251 Hanover St., Palo  
Alto. Dinner: 6:15 PM, Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto. No reserva-  
tions.

**CIRCUIT  
THEORY**  
NOV. 14

Story on  
page 9

**SECOND ONE-DAY SEMINAR: COMPUTER AIDED  
CIRCUIT DESIGN.**

NOV. 14, Saturday, 9 AM to noon, 1:00 PM to 5:00 PM, SLAC Auditorium, 2575 Sand Hill  
Road, Menlo Park. For registration information see October Grid.

**COMMUNICATION  
TECHNOLOGY**  
NOV. 17

Story on  
page 7

**THE CARTERPHONE DECISION.** Robert R. Tipton, Reg-  
istered Engineer, Attorney at Law.

NOV. 17, Tuesday, 8:00 PM, Skilling Auditorium, Stanford Univ. No-host cocktails and  
dinner: 6:00 PM, Dinah's Shack, El Camino, Palo Alto. Reservations: Don Kidder, (415)  
591-8461, ext. 525 by Nov. 15th.

**EAST BAY  
SUBSECTION**  
NOV. 23

Story on  
page 7

**SCREENING FOR FOREIGN EMPLOYMENT.** Robert  
C. Scott, Manager, Foreign Employment and Processing,  
Bechtel Corp., S.F.

NOV. 23, PG&E Center, 4801 Oakport St., Oakland. No dinner. Reservations for meeting:  
Hadi Monsef, (415) 764-5377 by Nov. 23rd.

**ELECTROMAGNETIC  
COMPATIBILITY**  
NOV. 16

Story on  
page 12

**USING THE SPECTRUM ANALYZER FOR EMC MEA-  
SUREMENTS.** Michael H. Forman, Product Marketing  
Engr., Hewlett-Packard Co., Microwave Div., Palo Alto.

NOV. 16, Monday, 8:00 PM, Hewlett-Packard Auditorium, 5301 Stevens Creek Blvd., Santa  
Clara. Dinner: 6:15 PM, Custom House Restaurant, 20060 Stevens Creek Blvd., Cupertino.  
Reservations: Don Clark, (415) 321-3320, ext. 404, by noon, Nov. 16th.

**ELECTRON  
DEVICES**  
NOV. 17

Story on  
page 12

**MOS TECHNOLOGY FOR THE '70s. PANEL DISCUS-  
SION.** Moderator: Ed Snow, Fairchild. 6 speakers from  
Intel Corp., G.I., National Semiconductor, IBM, Mostek  
and A.M.I.

NOV. 17, Tuesday, 8:00 PM, The Bold Knight, 769 No. Mathilda Ave., Sunnyvale. Cocktails  
at 6 PM, dinner: 7:00 PM. Reservations: Section Office, (415) 327-6622.

**ENGINEERING  
MANAGEMENT**  
NOV. 11

Story on  
page 8

**THE SUPPLY OF SCIENTIFIC AND ENGINEERING  
MANPOWER.** Surplus or shortage? Dr. Frederick E. Ter-  
man, Stanford University.

NOV. 11, Wednesday, 8:00 PM, Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto.  
Dinner: 6:30 PM. Reservations: Sue Mendell, (415) 321-2300, ext. 3619 by Nov. 10th.

**GOLDEN GATE  
SUBSECTION**  
NOV. 17

Story on  
page 8

**PUBLIC INTEREST vs. PRIVATE PROPERTY.** Sam H.  
Husbands, Jr., Associate Vice President, Dean Witter &  
Co., Inc. Luncheon meeting.

NOV. 17, 12 noon, Leopard Cafe, 140 Front St., San Francisco. Reservations: M. W.  
McLaren, (415) 764-6464 or Ken Walters (415) 399-2105 by Nov. 16th.



# calendar

INDUSTRY &  
GENERAL  
APPLICATIONS  
NOV. 19

Story on  
page 6

MODERN ELECTRIC HEATING. Stuart L. Forsyth, General Manager, ELECTREND Systems Division.

NOV. 19, Thursday, 7:30 PM, Marconi's Restaurant, 122 Battery St., S.F. \$5.00 incl. tax and tip. No-host cocktails at 6 PM, dinner: 6:30 PM. Reservations: W. Poynter, (415) 6697-7040; F. Trayer, (415) 431-7701 or W. Blinn, (415) 391-3230 by Nov. 16th.

INFORMATION  
THEORY  
NOV. 19

Story on  
page 7

EXPERIMENTS IN BANDWIDTH COMPRESSION. Earle D. Jones, Manager, Electronics and Optics Group, SRI, Menlo Park.

NOV. 19, Thursday, 8:30 PM, SRI Bldg. 1, 333 Ravenswood Ave., Menlo Park. Dinner: 6:00 PM, Velvet Turtle, 325 Sharon Park Dr., (Sharon Heights Shopping Ctr.), Menlo Park. Reservations: Miss Geri Gibling, 326-6200, ext. 3881 by Nov. 16th.

MICROWAVE THEORY  
& TECHNIQUES  
NOV. 11

SOLUTION OF FIELD EQUATIONS THROUGH COMPUTER-AIDED INTEGRAL EQUATION METHOD. Prof. Kenneth K. Mei, Dept. of Electrical Engineering and Computer Sciences, UC Berkeley.

NOV. 11, Wednesday, 8:00 PM, Hewlett-Packard Co., 5301 Stevens Creek Blvd., Santa Clara. No dinner.

NUCLEAR  
SCIENCE  
NOV. 17

Story on  
page 8

X-RAY ASTRONOMY. Dr. Thomas M. Palmieri, Research Physicist at Lawrence Radiation Lab, Livermore. Meeting open to U.S. Citizens only.

NOV. 17, Tuesday, 8:00 PM, LRL Personnel Bldg. 311, 7000 East Ave., Livermore. Dinner: 6:30 PM, Livermore Ranch, 875 Rincon Ave., Livermore. No reservations. Coffee and doughnuts will be served after the meeting.

PARTS, MATERIALS  
& PACKAGING  
NOV. 10, 17 and 24

Story on  
page 12

LAST THREE OF SIX SESSIONS ON MICROELECTRONICS. Session 4: Nov. 10 — Thick and Thin Film Reliability — Bill Littell. Session 5: Nov. 17 — Reliability Testing — Charles Trimble. Session 6: Nov. 24 — Potential Impact of the Beam Lead and Flip Chip Technologies in Packaging — Dr. W. Cox.

NOV. 10, 17 and 24, Tuesdays, 7:30 PM, Varian Associates Research Lecture Hall (Bldg. 8) 6011 Hansen Way, Palo Alto. See October Grid for application form.

POWER  
NOV. 10

Story on  
page 10

TOUR OF AIRCRAFT CARRIER U.S.S. MIDWAY. Limited to 100 persons. Ladies welcome.

NOV. 10, Tuesday, 7:00 PM — chartered buses, will leave the Engineers Club (Pine and Sansome Sts., S.F.) at 7:00 PM. Round trip \$1.00. Social hour at 5:15 PM and dinner at 6:00 PM at the Engineers Club. For dinner and tour reservations: Call or write Mrs. Helen Crawford, PG&E Co., Room 1327, 245 Market St., S.F. 94106; (415) 781-4211, ext. 2643 by Nov. 9th.

RELIABILITY  
NOV. 12

Story on  
page 13

FAILURE MODES & MECHANISMS IN INTEGRATED CIRCUITS. Frank Bower, Consultant, Integrated Technology Associates.

NOV. 12, Thursday, 8:00 PM, Physics Lecture Hall PH 104, Stanford University. Dinner: 6:30 PM, Stanford View Restaurant, 1921 El Camino, Palo Alto, preceded by "Happy Hour" at 6:00 PM. Reservations: Phil Guillot, (408) 742-7026 or Chuck Leake, 742-0824 by Nov. 11th.

SANTA CLARA  
VALLEY  
SUBSECTION  
NOV. 9

Story on  
page 13

JOINT MEETING WITH SAN JOSE STATE, STANFORD UNIVERSITY AND UNIVERSITY OF SANTA CLARA STUDENT BRANCHES. Panel discussion: FUTURE OF ENGINEERING IN THESE TROUBLED TIMES.

NOV. 9, Monday, 7:00 PM, University of Santa Clara Daly Science Center Bldg., Room 206. No dinner.

VEHICULAR  
TECHNOLOGY  
NOV. 16

Story on  
page 12

MARINE COMMUNICATIONS AND NAVIGATION. L. O. Nelson, Pacific Telephone and Ben K. Wright, Chief Engineer, Kaar Electronics.

RESERVATIONS: RESERVATIONS: NOV. 16, Monday, 8:00 PM, The Shadows Restaurant, 213-2nd Ave., San Mateo. Reservations: G. L. Godwin, (415) 894-4675 or 894-4492 by Nov. 13th.

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# Wideband monopulse direction finding

The November 18th meeting of the Professional Group on Antennas and Propagation will feature a talk by Mr. Louis G. Bullock of Sylvania Electronic Systems-West. Mr. Bullock will discuss Wideband Monopulse Direction Finding Techniques.

The basic requirement for obtaining the direction of arrival of received signals has become a complex system problem in recent years. Today's requirements define direction finding (DF) systems that must operate over several octaves of bandwidth and provide rms bearing angle accuracies on the order of 1 to 6 degrees. The over-all system, which includes the antennas, receiver, and processor, must handle multiple signals with a high probability of intercept and provide unambiguous direction-of-arrival information while continuously observing relatively large spatial fields of view.

Mr. Bullock will discuss the analysis and performance characteristics of four candidate wideband direction finding techniques investigated at Sylvania that can satisfy these DF requirements and performance goals.

The basic DF techniques include pure amplitude monopulse, phase and amplitude monopulse (two- and three-channel configurations), and pure phase monopulse. These DF approaches,

which represent classical as well as original concepts, are presented using the latest implementation of the frequency-independent class of log-periodic antenna elements. The basic broadband theory of operation, characteristic equations, and error analysis are formulated for each of the systems. In addition, experimental verification of the antenna performance will be presented.



*Louis Bullock*

Mr. Bullock received his BSEE degree from the University of Arizona, Tucson, in 1961. During 1961 he was a Research Engineer with the Jet Propulsion Laboratory, in Pasadena. From 1961 to 1963 he was a Research Assistant in the Electrical Engineering Department of the University of Arizona and held a research fellowship there. In the summer

of 1962 he was employed by the U.S. Naval Radiological Defense Laboratories in San Francisco where he conducted a study on the use of radioactive sources for locating flaws in welded joints. From 1963 to 1965 he was employed as a Research Engineer at Lockheed Missiles and Space Company, Sunnyvale, where he was involved with the design and development of unfurlable space vehicle antennas and broadband antennas. During 1966 he was employed at Dalmo Victor, Belmont, California where he was engaged in the development of high gain monopulse arrays and strip line components. From 1966 to the present he has been employed at Sylvania Electronic Systems-West, Mountain View, California, engaged in the development of precision broadband tracking and direction finding systems. He is currently head of the Antenna Systems Section.

Mr. Bullock is a member of Tau Beta Pi and is a candidate for the MS degree in Applied Mathematics at the University of Santa Clara.

The meeting will be held at the Lockheed Research Laboratories Auditorium in Bldg. 202, at 3251 Hanover St., Palo Alto, at 8 PM, Wednesday, November 18th. Meet the Speaker Dinner at Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto. Cocktail hour 5:30, Dinner 6:15 PM. No reservations required.

# Industry specialist on electric heating

Why should Electrical Engineers specify electric heating? Isn't it too expensive? What kind of equipment? Get these questions about electric heating answered by a leader in the industry.

The IGA Chapter November 19 Meeting is privileged to have as their speaker one of the most qualified men in the electric heating industry. Stuart L. Forsyth graduated from the University of Michigan and took graduate work at the University of Rochester in Rochester, New York. He has been in the electric heating business since 1945 and has contributed much to its development. He is a registered engineer in the State of California and a member of the American Society of Mechanical Engineers; the American Society of Heating, Refrigerating and Air Conditioning Engineers; and the Institute of Electrical

and Electronic Engineers where he serves on their domestic application and electric heating and air conditioning committees. He is presently President of the Electric and Gas Industries Association having served as Chairman of their Electric Heating Division for ten years. He has served as a member of the Standards Committee of the Electric League of Southern California, as well as a member of their Board of Directors.

Mr. Forsyth was a charter member of the National Electrical Manufacturers Association Electric House Heating Committee and helped write the NEMA Electric House Heating Standards and their Design Manual. He helped the National Headquarters of the National Electrical Contractors Association prepare their electric heating training pro-

gram. He has been a consultant to and helped many electric utilities throughout the country prepare their electric heating manuals and training programs.

Formerly Vice President and General Manager of the Comfort Heating Division of Montgomery Brothers, Inc., the exclusive representatives for Chromalox electric heating for the Western States, he now serves them as General Manager of ELECTREND Systems Division and as a special technical and management consultant.

The meeting will be held at Marconi's Restaurant, 122 Battery St., San Francisco, at 7:30 PM, Thursday, November 19, 1970. Dinner is at 6:30 PM and no-host cocktails at 6:00 PM. Reservations: W. Poynter, 697-7040; F. Trayer, 431-7701; or W. Blinn, 391-3230 by November 16.



## Experiments in bandwidth compression featured

The November 19 meeting of the Information Theory Chapter will feature a discussion by Earle D. Jones, Manager Electronics and Optics Group, SRI, on experiments in bandwidth compression. Two techniques are commonly employed to reduce the channel capacity required for transmission of information. The first approach attempts to remove redundancy from the source data without excessively degrading the usefulness of the information. The second approach does not depend on redundancy — rather, an attempt is made to recreate at the receiving terminal every original bit through the use of clever signal-encoding means.

Two experiments in bandwidth reduction will be described. The first experiment, a redundancy-reduction approach, achieved a ten-to-one reduction in bandwidth for gray-scale photographs off the earth's cloud cover derived from meteorological satellites. Sample photographs will be shown and compared with the unprocessed originals.

The second research program to be described had as its goal the reduction off the bandwidth required for facsimile transmission of documents. No gray-scale capability is required in this application and the video signal is binary. Multilevel encoding techniques will be described that are suitable for facsimile application.

Earle D. Jones, is Manager, Electronics and Optics Group, Engineering Sciences Laboratory, Information Science and Engineering Division. His specialized professional competence includes analysis and design of electronic-optical systems; design of television systems; facsimile systems, including bandwidth compression; electrostatic printing. His experience at SRI since 1956 has covered various research assignments. He has been affiliated with the Boeing Company in the Microwave Airborne Radar Division. He received his BS in Electrical Engineering in 1956 from GIT; and his MS in Electrical Engineering in 1958 from Stanford. He has published several papers and holds six patents in electronic circuitry, character generators, frequency synthesizers, and electrostatic printing systems. He is a member of IEEE and several other professional societies.

The meeting will be held at SRI with dinner scheduled at 6:00 PM at the Velvet Turtle Restaurant in Menlo Park. See calendar for details.

## The carterfone decision's impact



Robert Tipton

The Communications Technology Group will hear Robert Tipton speak on the legal aspects of the Carterfone decision at the meeting scheduled for Tuesday, November 17. The first portion of Mr. Tipton's discussion will be devoted to the impact of the Carterfone decision on the communications industry.

Since the decision by the F.C.C. in 1968 concerning the use of the Carterfone Device on common carrier lines, further decisions and studies by the FCC with respect to "foreign attachments" to telephone systems, and the use of telephone lines for data transmission have resulted in discussion of possible federal regulation of computer systems or services. Complete freedom in the use of customer-supplied "foreign attachments" could be beneficial but could also create legal and technical problems.

The balance of the meeting period will be open for questions and group discussions.

Mr. Robert Tipton's achievements in the fields of engineering and law make him the logical person to talk of the Carterfone decision and its impact on the Engineering community. Mr. Tipton received a BS degree in Engineering at the University of California at Berkeley in 1950. In 1955 Mr. Tipton received his California registration as an Electrical Engineer. He became a member of the California Association after his graduation from Hastings College of the Law in 1962. Presently Mr. Tipton is engaged in private practice specializing in patents, trade marks and litigation involving Engineering or scientific knowledge.

The meeting will be held at Skilling Auditorium, Stanford, preceded by cocktails and dinner at Dinah's Shack. See calendar for details.

## Screening for foreign employment

"Foreign Employment" will be the topic of the speech of the November meeting of the East Bay Subsection, scheduled for 7:30 PM Monday 23rd of November at PG&E Center, 4801 Oakport Street in Oakland.



Robert Scott

The speaker will be Robert C. Scott, Manager, Foreign Employment and Processing, Bechtel Corporation of San Francisco. In his speech, Mr. Scott, who himself has extensive overseas experience, will discuss such matters as: trends in overseas construction work, staffing for overseas projects (what experiences are required, what type of characteristics companies require), ad-

vantages and benefits of foreign employment, work schedule, compensation and taxes. Mr. Scott has engineering education from University of California and has been personnel manager of several engineering companies such as Tektronix Inc., Ampex Corporation, Columbian Petroleum Company and Arabian American Oil Company.

## NEW MEMBERS

The Section welcomes these new members:

D. R. Dickey	J. C. Onia
N. P. Doyle	L. B. Perry
D. N. Homan	R. A. Poor
S. Kimura	J. A. Voltin
W. H. McRedmond	H. Yamamoto
J. A. Moor	



# Too many engineers? not for long!

Many sociologists contend that the population is increasing at an intolerable rate. With technological knowledge also proliferating by orders of magnitude in short periods of time, will the supply of engineers and the quality of their education be able to meet the burgeoning industrial and governmental demands?

That question will be answered at the Engineering Group chapter meeting on November 11. Dr. Frederick E. Terman of Stanford University will discuss the present situation and look ahead to the problems and possible solutions of providing the technical manpower and the educational preparation needed to serve the future needs.

How many new engineering graduates may reasonably be expected in the future? Has engineering productivity been increasing — will it be greater in times to come? If so, how? Is there a need to make changes in our educational philosophy? The answers, furnished by Dr. Terman, to these and other questions are of great import to every engineer and engineering manager.

Frederick Emmons Terman received the AB and EE degrees from Stanford University and was awarded his Doctorate in Electrical Engineering from M.I.T. Returning to Stanford as an EE instructor, he successively became Professor, Executive Head of the EE department, and Dean of the School of Engineering. At the time of his retirement in 1965 he was Provost and Vice President of the University.

A prolific author of textbooks, handbooks, and technical articles, Dr. Terman is fondly remembered by several generations of engineering students who

learned radio and electronic fundamentals from his many writings. Recipient of a multitude of awards, medals, and honors, director of numerous corporations, he has, since his retirement, been extremely active as a working member or consultant of a profusion of committees and commissions involved with studies of engineering education.

A dinner before the meeting at Rick's Swiss Chalet. Beef Stroganoff, \$4.85 includes tax and tip. See calendar for details and reservation information.



Frederick Terman

## S. F. civic leader dies

Joseph S. Thompson, patriarch of a gifted San Francisco family, has died at the age of 92. Mr. Thompson, who was a pioneer in the field of electrical engineering, was the president of numerous San Francisco civic organizations.

Joe Thompson was a very interesting person and a speaker at the "old timers" nite program of IEEE on two occasions, the last being our Golden Gate subsec-

tion meeting on March 16, 1970, where he was the hit of the evening as usual.



Joseph Thompson

He was founder and president of Pacific Electric until the merger with Federal Electric to form Federal Pacific Electric. He was honorary chairman of Federal Pacific Electric until his ultimate retirement. He was a Fellow of IEEE.

## X-Ray Astronomy

The November 17 meeting of the Nuclear Science Chapter will feature Dr. Thomas M. Palmieri who will survey the young field of x-ray astronomy from the discovery of cosmic x-ray in 1962 to our present understanding of the sky as viewed in the keV energy region.

Dr. Palmieri received his B.S. degree from Rutgers and later attended the University of Wisconsin. He began his study of x-ray astronomy in 1965 under Professor W. Kraushaar. While at Wisconsin he was involved in the study of discrete sources and the observation of the diffuse component of cosmic x-rays. He received his Ph.D. in 1969 and is presently engaged as Research Physicist at Lawrence Radiation Lab., continuing his observation of low energy sources.

The meeting will be open to U.S. citizens only. It will be held at L.R.L. in Livermore. See calendar for details.

# Public interest vs. private property

The speaker for the Golden Gate Subsection luncheon meeting of November 17th is Sam Husbands Jr. He will speak on Public Interest vs. Private Property Rights. Mr. Husbands is Associate Vice President of Dean Witter & Company of San Francisco. He is presently a San Francisco Court Commissioner appointed by Governor Reagan, a member of the Board of Trustees for the Foundation of Economic Education, and a member of the Pelerin Society. He graduated from the Citadel and was a member of the United States Air Force from 1952-1955.

The meeting will be held at 12:00 Noon, Tuesday, November 17th at Leopard Cafe, 140 Front Street, San Francisco. For reservations contact John Michelsen, 764-6378, or Martin W. McLaren, 764-6464 by noon, Monday, November 16th.



Sam Husbands, Jr.



# Two speakers added to CAD seminar

In order to cover a broader range of topics, two more participants will be added to the already impressive list of lecturers scheduled on the second CAD Seminar, November 14th. Dr. William R. Dunn of Santa Clara University will discuss Computer Aided Circuit Layout and Dr. Harry B. Lee of Applicon Inc. will participate in the CAD workshop that follows the lectures. The biographies of the six lecturers are given below.

Shu-Park Chan received his MSEE and Ph.D. from the University of Illinois in 1957 and 1963, respectively. He joined the faculty of the University of Santa Clara in 1963. At the present time he is Professor and Chairman of the Electrical Engineering Department. He has authored an engineering textbook and several papers in the area of circuit theory and network topology, and holds

ministration from the University of Colorado in 1966. He joined the Hewlett-Packard Co. and worked four years in the area of microwave integrated circuits and cable television amplifier design, and conducted seminars throughout the U.S. on scattering parameters. Since 1970 he has been Project Manager at the Microwave and Optoelectronics Division of Fairchild, working with bidirectional cable television systems. He has published several papers and articles on Computer Aided High Frequency Circuit Design. He is a member of IEEE, Tau Beta Pi, Eta Kappa Nu, and Sigma Tau.

Zvonko Fazarinc was born in Yugoslavia, received the degree of Electrical Engineer from Ljubljana University in 1953 and a Ph.D. in EE from Stanford University in 1964. His professional activities involved, among others, micro-

ford University in 1963. Mr. Hall worked five years for Sylvania Electronics Defense Laboratories on microwave systems and tunnel diode circuits, and seven years for the Hewlett Packard Company where he was responsible for microwave component development. In 1970 he formed Dean Hall Associates of which is is President. He is a member of IEEE, RESA and APA, holds several patents and has written articles on ferroelectric materials, Schottky barrier mixers and frequency multipliers.

Dr. Harry B. Lee is founder and Vice President for Research for APPLICON Incorporated. He received his SB, SM and Ph.D. degrees in Electrical Engineering at M.I.T. in 1957, 1959, and 1962 respectively. In 1964 he was awarded the Browder J. Thompson prize from the IEEE. In 1967 he joined the Digital Computers Group at M.I.T. Lincoln



William Dunn



Shu-Park Chan



Les Besser



Zvonko Fazarinc



Robert Hall



Ted Johnson

an international reputation in the same field. Professor Chan is a member of Tau Beta Pi, Eta Kappa Nu, and Sigma Xi honorary societies and Senior Member of the IEEE.

William R. Dunn received the AB degree in Physics from the University of California, Berkeley in 1958 and MS and Ph.D. degrees in Electrical Engineering from the University of Santa Clara in 1967 and 1970 respectively. He has been employed by the Lockheed Missiles and Space Company in Sunnyvale, California, performing work in systems analysis, computer-aided design, and microelectronics design and processing. He is at present Assistant Professor of Electrical Engineering at the University of Santa Clara, Santa Clara, California. His main interests lie in network topology, synthesis and solid state circuits.

Les Besser, a native of Hungary, received his BS in EE and Business Ad-

ministration from the University of Colorado in 1966. He joined the Hewlett-Packard Laboratories in 1965, he has devoted his efforts to low level signal detection and analog network analysis, and lately to the usage of minicomputers as research tools.

Edward T. Johnson received a BSEE and MSEE from the University of Illinois in 1960 and 1961 and the Engineer's Degree from Stanford University in 1968. He has been working at the Development Laboratory of IBM since 1961 in an Advisory Engineer position. For the past seven years, Mr. Johnson has been concentrating on computer-aided design and published papers on the same topic. He is the co-author of the IBM LISA and GSPAN programs.

Robert D. Hall graduated from Reed College in 1955 with a BA in Physics and received his MS in Math from Stan-

ford University in 1963. Mr. Hall worked five years for Sylvania Electronics Defense Laboratories on microwave systems and tunnel diode circuits, and seven years for the Hewlett Packard Company where he was responsible for microwave component development. In 1970 he formed Dean Hall Associates of which is is President. He is a member of IEEE, RESA and APA, holds several patents and has written articles on ferroelectric materials, Schottky barrier mixers and frequency multipliers.

See October Grid for registration form and details of the November CAD Seminar.



# "Ultra high speed data communications-the new frontier"

C. Louis Cuccia of Philco-Ford Corporation, Palo Alto, will address the Aerospace & Electronic Systems Chapter at their Nov. 19th meeting. He will speak specifically on the new frontier of ultra-high speed digital communications representing systems with transmission rates up to 1000 megabits per second.

First, the history of digital communications will be reviewed showing the growth of data rates from the kilobit per second range for both commercial and satellite communications to the now commonly-used rates up to 10 megabits per second. This leads into the recent developments extending to millimeter wave carriers.

The technology of ultra-high speed addresses new requirements, from message transmission for commercial color TV, to picturephone, to imaging of earth features and resources using orbiting photographic satellites to new techniques of spectrum utilization based on time-division multiple-access, serving a multiplicity of users.

Actual systems will be discussed involving ultra-fast coding techniques,



C. Louis Cuccia

multiplexing, and the latest carrier technology with biphase and quadriplex shift-keying of microwave and millimeter wave carriers, together with the use of pulse-position modulation in new laser communication systems. These new systems have profited from the rapid growth of new solid-state technologies, including ultra-fast switching diodes and bipolar and mosfet transistor integrated circuits, storage and LSI techniques.

The talk will conclude with a discus-

sion of the overall noise, synchronization, and common-clock requirements for a national or international system, and the effects of system impairments on the quality of the received information.

C. Louis Cuccia, Manager of the RF Systems Department at the Western Development Laboratories of Philco-Ford has extensive experience in microwave tubes and systems and very high speed digital systems. He has authored a textbook on Harmonics, Sidebands and Transients in Communication Engineering, has written more than fifty technical articles, has over 40 patents, and is presently Associate Editor of Microwave Journal.

Joining RCA Laboratories in 1942, following graduation with the MS and BSEE degrees from the University of Michigan, he performed research and development on microwave devices including traveling-wave tubes, solid-state oscillators and amplifiers. Mr. Cuccia was Manager of the RCA West Coast Microwave Engineering Laboratory from 1960 to 1963. See calendar.

## USS midway tour for power group

One of the major fleet units of the U.S. Navy for the 1970's will be toured by the San Francisco Power Group for the November 10, 1970 meeting. Undergoing extensive modernization at the Hunters Point Naval Shipyard, the aircraft carrier, U.S.S. Midway, boasting a four-acre flight deck, 1000 ft. overall length, 68,000-ton displacement, and 200,000 hp main drives, will be open for inspection. Special efforts will be made to tour the power generation and distribution facilities aboard this floating city of approximately 3000 people.

The tour will be preceded by a social hour at the San Francisco Engineers Club, ending at 5:15 PM, with dinner at 6:00 PM. All people making the trip will board chartered buses leaving from the Engineers Club, at Pine and Sansome, at 7:00 PM. The buses are scheduled to return to the Engineers Club at about 10:00 PM. All tour members must plan on traveling on the chartered buses as admission to the shipyard, etc., will be handled while traveling on the buses. Cost of the bus transportation will be \$1.00 per person, round trip,

payable when boarding.

The tour will be limited to the first 100 calling or mailing reservations to Mrs. Helen Crawford, c/o Pacific Gas and Electric Company, Room 1327, 245 Market Street, San Francisco, Cali-

fornia 94106, telephone (415) 781-4211, extension 2643. Ladies are welcome. The Navy has made the suggestion that the trip will be more comfortable if slacks and flat-heeled shoes are worn.

U.S.S. Midway





# Air quality prediction problems

A unified approach to the problem of controlling air quality in the dispersion zones about industrial emission sources is the subject of discussion at the Automatic Control Chapter meeting November 17. The problem is formulated as a mathematical optimization problem and solved using certain optimization techniques such as mixed integer programming. The objective function for industrial use is related directly to the profitability of the entire plant: the plant is operated at maximum profit subject to constraints that involve both the operation of the plant and ambient air quality. The ambient air quality depends on both the emission characteristics of the pollutant source and the microeteorological conditions near the plant.

In the talk by Charles H. Wells of Systems Control Inc., the problem of predicting ambient air quality from measurements of pollution levels at remote sites is described. Since air quality standards include both time and frequency averages, the complexity of short and long term air quality prediction problem increases. Microeteorological data including estimates of air stability, wind speed and elevation angle statistics, and wind azimuth statistics are required for accurate air quality prediction. Estimates of emission source characteristics such as stack height, exit velocity, mass flow, exit temperature, etc. are also necessary for accurate prediction.

Background ambient pollution levels in multi-polluter environments also increase the complexity of the prediction problem. This problem can be overcome by considering background pollution levels as Markov noise processes, the statistics of which are unknown. SCI has developed stochastic pollutant dispersion models for use in air quality prediction and methods for identifying the unknown parameters in these models using techniques such as maximum likelihood and Kalman filtering/smoothing. Noisy data from the remote pollution monitors, emission sources, and the meteorological tower are used as input to these computer programs to identify the air quality prediction model.

Dr. Wells received the BE degree in chemical engineering from Vanderbilt University, the MS degree in chemical engineering, and the D.Sc. degree in systems, mechanical, and aerospace en-

gineering from Washington University, St. Louis, Mo.

He has worked with Shell Development Company, Monsanto, and IBM, and served two years as a Research and Development Coordinator with the U.S. Army NIKE-X Project Office with the rank of Captain. Since August, 1968, he has been with Wolf Management Services in Palo Alto. During this period he has performed research on the application of modern control theory to industrial processes and the development of algorithms for direct digital control. Engineering assignments have included application of estimation theory to re-entry vehicle tracking, fault detection and location in power systems, optimal control of antimissile missiles, and estimation of the states of a BOF. In August, 1969, he became Director of the Process Control Division of Systems Control, Inc., a company formed by the staff of Wolf Management Services. He has published papers in the IEEE TRANSACTIONS ON AUTOMATIC CONTROL and the AIChE Journal.



Dr. C. Wells

The meeting will be held at Lockheed Auditorium, Bldg. 202, 3251 Hanover Street, Palo Alto, at 8:00 PM Tuesday, November 17, 1970. Dinner at 6:15 PM at Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto. No reservations are required.

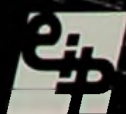
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## Marine communications and navigation aids

The Vehicular Technology Chapter meeting on November 16th will hear two speakers on marine communications and navigation. Ben K. Wright will discuss applications and limitations of navigation aids available to small craft operators. Included will be radar, direction finding equipment and position locating equipment.

Mr. Wright graduated in Communication Engineering from Stanford in 1941. He is presently Director of Engineering at Konel Corporation in South San Francisco. As a Development Engineer, he has worked as Chief Engineer at Kaar Electronics and with Canadian Marconi in Montreal 1966-1968.

Leroy Nelson will review communications facilities available to the small craft operator. New FCC rules now in effect and changes will be discussed. Mr. Nelson is presently a Staff Engineer in the General Administration Engineering Department of The Pacific Telephone Company which he joined in Seattle, Washington in 1941. He worked in the Plant and Engineering Departments in Seattle until moving to the Company headquarters office in San Francisco in 1955. For several years his work has been primarily concerned with the FCC licensing and FCC aspects of operating various telephone company radio stations.

The meeting will be held at the Shadows Restaurant in San Mateo. See calendar for details.

## The spectrum analyzer for EMC measurements

Mr. Michael H. Forman, Product Marketing Engineer in the Microwave Division of Hewlett-Packard will describe the theory of measurement and calibration of the spectrum analyzer instrument at the November meeting of the Electromagnetic Compatibility Group. He will present information on the use of the instrument and will have an analyzer set up to demonstrate. The talk will also include how to deal with problems which arise during the use of a spectrum analyzer.

Mr. Forman received his BS degree in Electrical Engineering at UCLA.

The meeting will be held in the Hewlett-Packard Auditorium in Santa Clara, preceded by dinner at the Custom House Restaurant. See calendar for details.

## PMP microelectronics course

The last three sessions of the PMP Microelectronics Course will be held at Varian Assoc. in Palo Alto.

Session 4: November 10, Bill Littell, Supervising Engineer in Charge of Thick Film Processing, Fairchild and Weldon Jackson, Hewlett Packard.

The speakers will present thick and thin film reliability. Bill Littell will give a review of thick film processing technology. The presentation will center on the reliability of thick film circuits from a user point of view. Criteria for distinguishing between reliable thick films and questionable thick films will be presented. Resistor trimming from a reliability point of view will be discussed.

Weldon Jackson will talk about the fabrication properties and problems of thin film integrated circuits. Reliability will be emphasized through discussion of process control, aging mechanisms, and high stress testing.

Session 5: November 17, Charlie Trimble, Engineering Section Manager, Hewlett Packard, L. G. Reis, Jr., Research Specialist for S.S.D. Reliability and Safety, Lockheed.

Reliability testing will be the topic of the fifth session. Charlie Trimble's talk will be based around the following state-

ment: The similarities of digital integrated circuits and projections of new developments serve as a good starting point for the definition of a generalized solution to integrated circuit testing. Emphasis is placed on the approach to this definition directed primarily at the manufacturers and large scale users of digital integrated circuits.

L. G. Reis, Jr. will outline a complete test program which will greatly reduce the possibility of defective parts escaping detection and being shipped. This procedure is intended to shift the risks associated with testing from the user to the manufacturer. This process is designed principally for the aerospace industry where the highest attainable reliability is required; for other applications a cost tradeoff will have to be evaluated.

Session 6: November 24, Dr. W. Cox, Hugel Industries.

The final lecture will discuss the potential impact of the beam lead and flip chip technologies on packaging. The possibilities of attaining higher reliability at lower cost through automated assembly techniques using flip chip or beam lead devices will be considered. See October Grid for registration form.

## MOS technologies for the 70's

Silicon gate, IMOS, thick oxide, MNOS. These are MOS technologies introduced during the 60's. Which will be significant in the 70's? What are the advantages and disadvantages of each? Which will lead to high complexity, low cost (<1¢/bit) circuits?

Questions such as these will be discussed by a panel of distinguished engineers and scientists (see box below) from companies prominent in the production of MOS integrated circuits. Edward H. Snow of Fairchild R. & D. Laboratories will act as moderator.

The meeting will be held at the Bold Knight Restaurant in Sunnyvale on Tuesday, November 17. Cocktails (6:00 PM) and dinner (7:00 PM) will precede the panel discussion (8:00 PM). Please call the section office, 327-6622, for reservations by Noon, November 17.

*Moderator: E. H. Snow — Fairchild*

The Panel:

L. V. Gregor	IBM	n-channel
E. F. Kvamme	National	<100>, A1 gate
G. E. Moore	Intel	Si gate
J. L. Seeley	GI	MNOS
L. J. Sevin	Mostek	IMOS
W. E. Wheeler	AMI	<111>, A1 gate



# Engineering future in trouble today?

Never before have we seen so many of our engineering associates on the unemployment rosters. The article "Laid Off" in the September issue of the Spectrum talks about the "Do's" and "Don'ts" of job seeking. But what does the future hold?

The Santa Clara Valley Subsection and the student branches from the University of Santa Clara, Stanford University and San Jose State College plan to hold a panel discussion regarding this very timely subject.

The Panel consists of M. B. Rudin, President, Precision Monolithics, Inc., Santa Clara; R. A. Power, IBM Systems Development, San Jose; R. A. Martin, General Traffic Engineer, Pacific Telephone, San Jose; and P. H. Simpson, Engineer, Microwave Carrier Planning, Pacific Telephone, San Jose.



Mr. Rudin, SCVSS Chairman, has performed work and written papers on analog integrated circuits and related subjects. He was Manager of LIC R and D at Fairchild Semiconductor until November, 1968, when he left to form his own company.



Mr. Power, SCVSS Secretary, is presently Advisory Engineer at the IBM Systems Development Division Laboratory in San Jose and is involved in the design of AC and DC power systems for new computer products. Mr. Power is a California registered Electrical Engineer.



Mr. Martin, SCVSS Treasurer, began his career with Pacific Telephone as a transmission engineer in San Francisco. From 1959 to 1961 he was a member of the Bell Telephone Laboratories technical staff. Previous to his present assignment, he was Transmission and Customer Service Engineer for the Central Counties Area of Pacific Telephone. Since 1967 he has been the Gen-

eral Traffic Engineer for the Central Counties Area.

Mr. Simpson received his BSEE from San Jose State in January, 1970. Since that time, he has been working on microwave and special services planning in the Central Counties Area of Pacific Telephone.

The meeting will begin at 7:00 PM on November 9 at the Daly Science Center, Room 206, at the University of Santa Clara. Members may park at either the Mission entrance or the engineering parking lot across the El Camino. The Daly Science Center is located behind the Art Gallery at the Mission entrance.

## Failure modes and mechanisms in IC's

Although most semiconductor devices have no fundamental wear-out mechanism, there are a number of failure modes associated with them. In integrated circuits these same modes occur in varying degrees.

The speaker at the Reliability November 1 Meeting will describe some of the more common causes of degradation and catastrophic failure in terms of the physics, chemistry, metallurgy, and mechanics of their occurrence. He will cover the characteristics of silicon planar structures, materials, and processing as well as the assembly and packaging procedures used in MOS and bipolar I.C. fabrication. Recently implemented techniques developed to reduce or eliminate specific failure mechanisms will be discussed.



Frank Bower

Mr. Frank H. Bower, the featured speaker, heads Integrated Technology Associates, in Palo Alto, and is a Senior Staff Consultant for ICE Corporation of Phoenix, Arizona. He is Vice President of Solid State Equipment Corporation of Philadelphia.

He has held senior management posi-

tions in semiconductor and integrated circuit development and production operations for Western Electric, Motorola, Sylvania, and Raytheon. With ICE he has taught integrated circuit technology, prepared texts, and performed consulting projects throughout the world. He has published articles on device fabrication, packaging, and production facilities.

A Senior Member of IEEE, he is past GED Boston section chairman. He is a charter member of ISHM and chapter program chairman for 1970-1971. Following graduation in Electrical Engineering from Lehigh University where he was elected to Tau Beta Pi and Eta Kappa Nu, he served as a submarine electronics officer in W.W. II.

The meeting is scheduled at 8:00 P.M. Thursday, November 12, at Stanford University Physics Lecture Hall PH104. Dinner at 6:30 P.M. and a Happy Hour at 6:00 P.M. will be held at the Stanford View Restaurant, 1921 El Camino, Palo Alto. For reservations call Phil Guillot at 742-7026 or Chuck Leake at 742-0824 by Wednesday November 11th.

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## Mark your calendar

The 12th Annual Winter Convention on Aerospace and Electronic Systems (WINCON) will be held on February 9 through 11, 1971, at the Biltmore Hotel in Los Angeles, California.

WINCON is sponsored jointly by Aerospace and Electronic Systems Group and the Los Angeles Council of the Institute of Electrical and Electronic Engineers. The 1971 Meeting will focus on the impact of recent changes in the Aerospace and Electronics market, and the effect of these changes on both the companies and individuals that make up our industry.

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## Minimal interest in social topics

On the basis of the turnout for the first meeting on September 21, approaching 25, there appears to be surprisingly little interest in such topics. The meeting was a panel discussion on the role of the technical expert in modern society — his responsibilities and limitations. Strong views were expressed by the panelists (enough to cause one member of the audience to stomp out in the middle of the session muttering under his breath) and there was lively participation from the audience. The panel, moderated by Oscar Firschein, Lockheed Research Laboratories, consisted of Dr. Sidney Drell, Deputy Director of the Stanford Linear Accelerator, David Ransom, Pacific Studies Center, Dr. Paul Shields, Technology and Society Committee, and Dr. Stephen Zifferblatt, School of Education, Stanford University.

Mr. Ransom was concerned about the elitist aspect of experts, leading to the control of the many by the few. He felt, also, that the "technocrat" was a resource who often provides services with little regard as to how the results of his services will be used.

Dr. Drell described his personal experience in serving on the President's Scientific Advisory Committee (PSAC), and indicated several approaches for extending such expert committees to the legislative branch of government. In particular, he noted that the Federation of American Scientists has formed a technical advisory Committee to make

studies of a technical nature to Congress, and that the California Legislature had recently formed a similar citizen's committee to advise on technical questions concerning problems such as pollution and water resources.

Dr. Zifferblatt wondered whether the technologist is aware of the long-term physical and social consequences of the recommendations that he makes. He noted that little formal study had been made of the role of the technical expert in modern society, and suggested that studies would indicate some of the problems to be faced in using the technical expert.

Dr. Shields was concerned about the lack of review mechanisms and the secrecy inherent in the present use of experts by the executive branch of government. He suggested that perhaps a code of ethics for technical experts might be appropriate stating that the results of expert study must be made public.

An hour-long question and answer period provided a spirited discussion of these points, and some fairly strong exchanges of opinion.

Another attempt to present socially oriented technical issues will be made on October 19, when Mr. Arthur Bushkin will discuss the problem of privacy in an era of large computer data banks. It is hoped that the small attendance of the first meeting was just an anomaly, and that technical people are really interested in the social effects of technology.

## Employment workshop for engineers

Recent cutbacks in defense contracts have resulted in a number of engineers, including IEEE members, losing jobs. The Executive Committee of the San Francisco section in their meeting of September 24, expressed their concern over the situation. The Committee approved the co-sponsorship with three other engineering groups in a program to assist our membership in seeking jobs of their field of interest. The three engineering organizations include: American Institute of Aerospace and Aeronautics Engineers, Northern California Technical Personnel Committee and Western Electronics Manufacturers Association (WEMA).

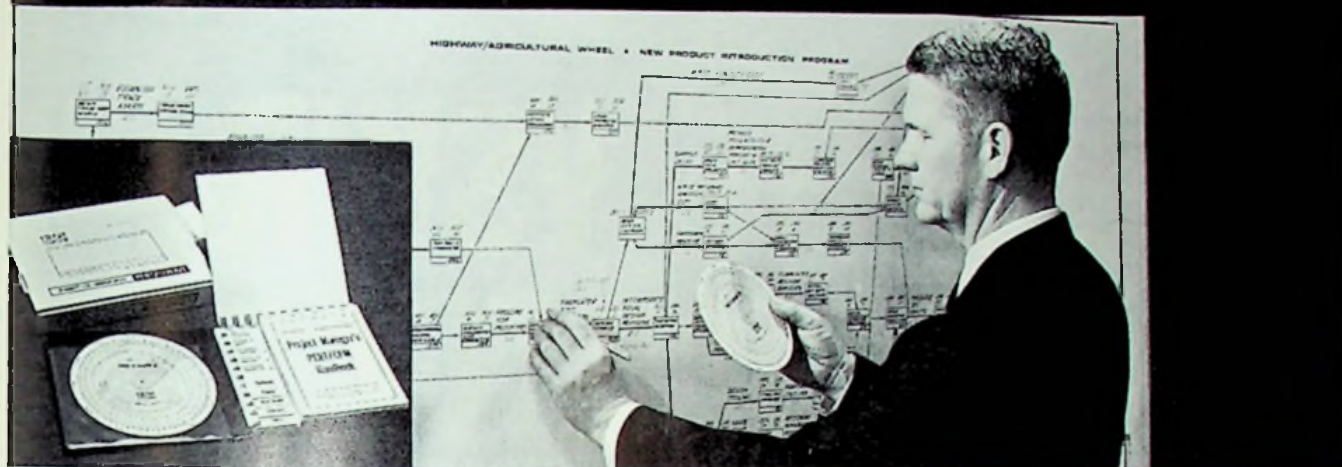
The program will include three, three-hour workshops, one per week beginning in early November and at a location convenient to most applicants.

In addition to the workshop, a catalog listing names and addresses of engineering companies will be available at the IEEE San Francisco Section Office in Palo Alto.

The San Francisco Section Chairman, Dr. Don Pederson, has appointed Section Director, Jerry Schloss, to be co-chairman of the program. Several members of our section have also volunteered their help. To obtain further information, regarding registration call WEMA's office at (415) 327-9300.



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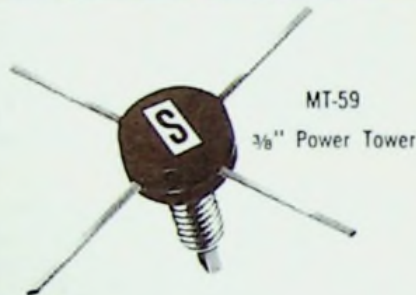
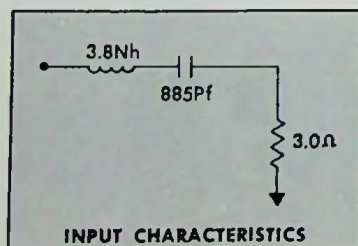
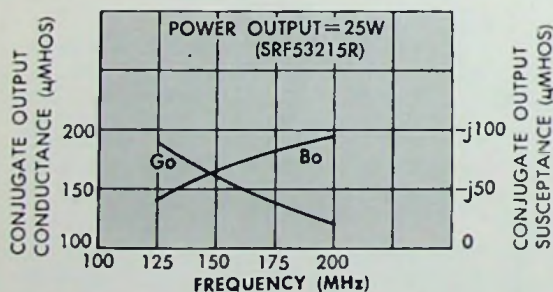
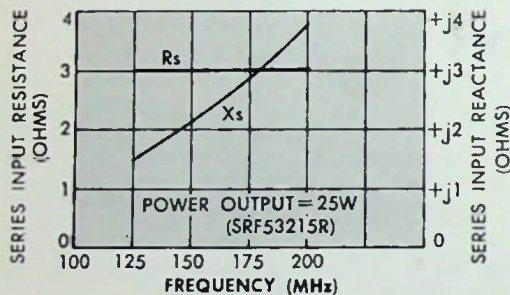
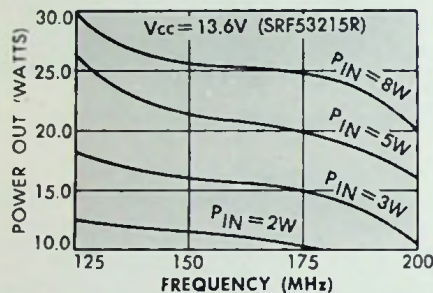


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