EDITOR'S PROFILE of this issue

from a historical perspective …

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

April, 1967:

Cover: the focus is on human factors engineering, the subject of an upcoming conference in Palo Alto. More details on page 4.

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

SAN FRANCISCO SECTION

THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.

IEEE Grid

APRIL 1967

SPECIAL ISSUE

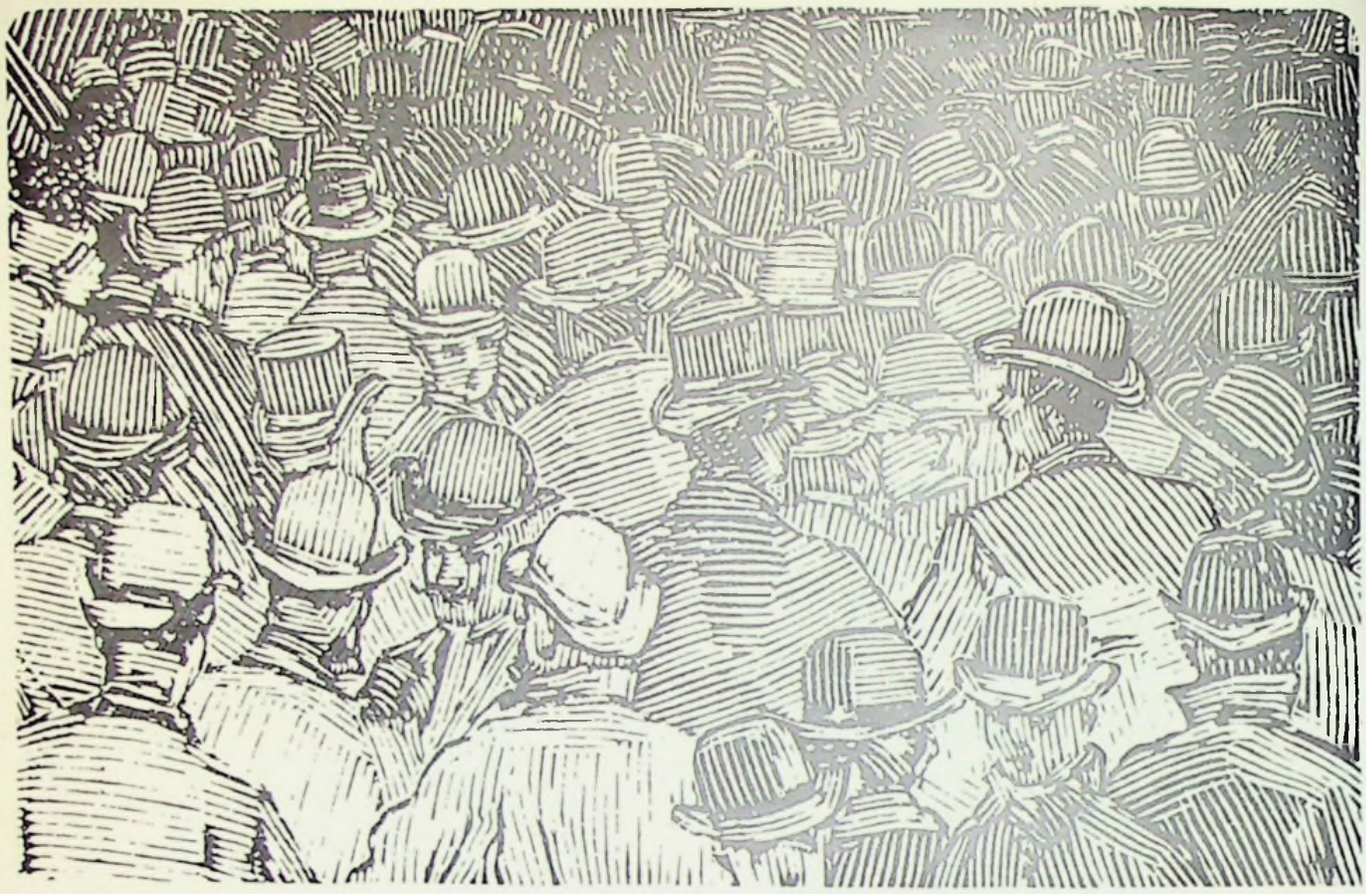
EIGHTH CONFERENCE ON HUMAN FACTORS IN ELECTRONICS

MAY 3-5

PALO ALTO CABAÑA

meeting reminder

Aerospace & Electronic Systems, Thursday, April 27
Antennas & Propagation, Tuesday, April 18
Automatic Control, Tuesday, April 18
Computer, Tuesday, April 25
East Bay Subsection, Monday, April 24
Electromagnetic Compatability, Tuesday, April 25
Engineering in Medicine & Biology, Tuesday, April 18
Engineering Management/Reliability, Wednesday, April 19
Industry & General Applications, Thursday, April 13
Power, Tuesday, April 11
Reliability/EM, Wednesday, April 19
San Francisco Section/SCVSS, Friday, April 7; SFS, Wednesday, June 7
Santa Clara Valley Subsection/SFS, Friday, April 7



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contents

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advertising

the section

MEMBERSHIP

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

F. B. Harris
G. F. Heldro
F. K. Kong
P. P. Q. Lai
A. H. Lockwood
G. A. Massey
E. R. Parker
E. P. Peters
C. Ryan
E. M. Thompson
C. L. Schiele
J. P. Watney
A. F. Waugh

Inami

Tilles

region six news

INAMI, TILLES NAMED OFFICIALS

Frank Inami, assistant head, special projects and operations, electronic engineering division, Lawrence Radiation Lab, Livermore, has been appointed secretary-treasurer of Region Six, IEEE, by Dr. Stanley F. Kaisel, recently-elected delegate/director of the region. Inami was formerly member-at-large for membership of the regional committee and has been active in section membership affairs for many years.

Dr. Abe Tilles, staff engineer, research and engineering division at LRL, is awards chairman of Region Six, having been active on section committees in the field for both AIEE and IEEE.

grid erratum

GUNDY/LEIFER

In a WESCON story carried in the December issue titles of two 1967 directors were inadvertently transposed. Phillip L. Gundy is 1967 chairman of the WESCON board of directors, and Meyer Leifer is chairman of the executive committee.

cover

Based on Air Force anthropometric data for pilot size studies, the "Percentile Man" was developed by Computer Graphics of the Boeing Co., Seattle, by overlaying plots of a three, a fifty and a 97 percentile figure all produced from the same basic data. The gross dimensions of any individual can also be duplicated. The figure is animated by computer programs for use in human factors engineering.

THEME: AUTOMATION/PERFORMANCE/ACCEPTANCE COMPROMISES IN SYSTEM DESIGN

PROGRAM

Nearly 60 papers will be presented during the Eighth Annual IEEE Symposium on Human Factors in Electronics, May 3-5, at the Palo Alto Cabana.

Dr. James C. Bliss announces the following sessions and chairmen for the symposium:

A. Models of cognitive processes
Prof. Richard D. Smallwood, Stanford University

B. Man-machine considerations in sensory aids design
Dr. Patrick Nye, Calif. Institute of Technology

C. Behavorial models for manned vehicle control
Duane McRuer, Systems Technology Inc., Hawthorne

D. Interactive computer display systems
Robert Taylor, Advanced Research Projects Agency, Wash. D.C.

E. Command-control systems
Ralph Seitle, Philco-Ford Corp., Palo Alto

F. Human Factors in transportation vehicles
Dr. George A. Hoffman, University of California at Los Angeles

G. Measurement of speech quality
Dr. H. R. Silbiger, Bell Telephone Laboratories, Holmdel, N. J.

hfe symposium

EXHIBITORS

Planning to have booths at the Cabana at press time:

Information Retrieval, Inc.
McDonnell Company
Master Dynamics Corp.
Bunker-Ramo Corp.
Systems Technology, Inc.
Optical Coating Laboratory, Inc.
McGill & McGill
Serendipity Associates

H. New considerations for automating and conceptualizing electronic maintenance
Dr. Bernard Manheimer, Franklin Institute, Arlington, Va.

I. Designing vehicles for automatic control and safety
Dr. Slade Hulbert, University of California at Los Angeles

J. Displays for aerospace applications
R. O. Besco, American Airlines

There is a variety of topics clustered around conference theme sessions—automation/performance/acceptance. Of particular note are the sessions on transportation, sensory aids design and speech quality which are somewhat new departures from more traditional session topics. An attempt was made to provide an automation theme, but not to the exclusion of exciting new areas for the human factors specialist.

hfe symposium

TECHNICAL TOURS

Group I will tour Ames Research Center, established in 1940 for research in the aeronautical sciences. In 1961, NASA's Life Sciences Directorate was initiated, with responsibilities for all aspects of research concerning man in aeronautical and astronautical systems and in extra-terrestrial environments. Facilities pursuant to these goals include a vast inventory of vehicle simulation devices, stress devices, full and part-task research apparatus, and environmental control devices, including ARC's five-degree-of-freedom centrifuge used for vehicle control studies up to six "g's".

Group II will be visiting two places at Stanford:

- The Stanford Linear Accelerator (SLAC), the world's longest (2 miles) nuclear research equipment in existence. A complete overview of its operations and an inspection of the equipment will be given by the researcher in charge of the accelerator.
- The audio-visual center including the computerized teaching center. The automated teaching operation was first incorporated on a test basis by this Stanford group in an East Palo Alto School as the first of its kind of operation in the world.

Transportation will be furnished to and from both tour areas.

REGISTRATION

The registration desk in the lobby of the Cabana Hotel will be open from 6:00-8:00 p.m., Tuesday, May 2 and from 7:30 a.m. to 5:00 p.m. each day of the meeting. To make advance registration, fill out the registration coupon and mail to

Registration Chairman
IEEE Human Factors
8th Annual Symposium
William J. Ereneta
Serendipity Associates
199 First Street
Los Altos, California 94022

Checks should be made out to IEEE HUMAN FACTORS, 8TH ANNUAL SYMPOSIUM. Registration rates are as indicated on the coupon. These rates include a copy of the symposium digest, two luncheons, and the banquet. Additional digests may be purchased at the registration desk.

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COMPANY _____

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Wife will ( ) will not ( ) attend symposium (Please check)

TOURS: (Please check)

Yes No
( ) ( ) San Francisco Night Life Tour, 3 May at 6 p.m. $19.75 (transportation, dinner, drinks and entry into three shows).
( ) ( ) Tour I. NASA facility at the Ames Research Center, 4 May at 1:30 p.m., OR
( ) ( ) Tour II. Stanford University and the Stanford Linear Accelerator Facility, 4 May at 1:30 p.m.

CHECK APPROPRIATE SPACES	Postmarked before April 20, 1967		After April 20	
Member: IEEE ( )	$25.50[3]	$12.00[4]	$27.50[3]	$14.00[4]
Nonmember[2] ( )	$35.50[3]	$22.00[4]	$37.50[3]	$24.00[4]
Wives Activities[1] ( )	$ 3.00		$ 4.00	

Total Remittance
$ _____

1. Cost to include two cocktail parties and transportation for tours.
2. $10.00 may be applied towards IEEE membership.
3. Includes 2 lunches and 1 dinner.
4. No meals included.

Belsley *Bliss* *Patton* *Sadenwater* *Sadoff* *Kubokawa* *Randle*

STEERING COMMITTEE FOR EIGHTH ANNUAL EVENT ALL FROM AMES, STANFORD

The steering committee for the 1967 G-HFE Symposium is headed by Steven E. Belsley, chairman. Mr. Belsley is deputy assistant director for life sciences at NASA's Ames Reasearch Center at Moffett Field. The committee began its work of planning and executing the details of the conference in late summer of 1966.

Other members of the committee are the symposium officers and the heads of the various committees. Dr. James C. Bliss, group leader of the bioinformation systems group at Stanford Research Institute is technical program chairman. Dr. R. Mark Patton, chief, human performance branch, Ames Research Center, and Mrs. Julie Sadenwater, human performance branch, ARC, have joint responsibility for publications. Melvin Sadoff, chief, man-machine integration branch, Ames Research Center, is chairman for finances. Charles C. Kubokawa, man-machine integration branch, Ames Research Center, has exhibits and local arrangements. Robert J. Randle, man-machine integration branch, ARC, is in charge of publicity.

SYMPOSIUM AT A GLANCE

IEEE (G-HFE) Group Symposium, May 1967 · TECHNICAL SESSIONS

HEME: "Automation-performance-acceptance compromises in system design"

ME	MAY 2ND	MAY 3RD	MAY 4TH	MAY 5TH
9:000		Registration — Cabana Lobby 8:30 Welcome Address South & Central Maximus	8:30 Session E — South Maximus Session F — Central Maximus	8:30 Session I — South Maximus Session J — South Maximus
10:00		9:00 Session A — South Maximus SMALLWOOD "Models of Cognitive Processes" Session B — Central Maximus NYE — "Man Machine Considerations in Sensory Aid Design"	SEITLE "Command Control Systems" HOFFMAN "Human Factors in Transportation Vehicles"	HULBERT "Designing Vehicles for Automatic Control and Safety" BESCO "Displays for Aerospace Applications"
11:00				
12:00		12:00 Lunch With Guest Speaker CAPT. R. BECK (ALPA, TWA)	12:00 Lunch	12:15 SPEAKER Lunch Closing Remarks & Discussion
1:000				
2:000			1:30 G — SILBIGER "Measurement of Speech Quality" H — MANHEIMER "New Considerations for Automating and Conceptualizing Electronic Maintenance"	
3:000		2:00 Session C — South Maximus McRUER "Behavioral Models for Manned Vehicle" Session D — Central Maximus TAYLOR — "Interactive Computer Display Systems"	Group I — Ames Research Center — Simulators, Wind Tunnels, Computer & Research Areas or Tours Group II — Stanford Linear Accelerator — Audio-Visual Computerized Teaching Center	2:00 FREE TIME
4:000				
5:000				
6:000		5:00 Free Hour	5:00 Free Hour	
7:000	6:00-8:00 Registration Cabana Lobby	6:00-7:30 Cocktails in Display Area North Maximus (Hosted) 7:30 San Francisco Night Life Tour (Optional, Sign Up)	6:00-7:30 Cocktails North Maximus (Hosted) 7:45 Banquet with Noted Guest Speaker — South and Central Maximus	

hfe symposium

FOR THE LADIES

The women's activity will officially get on the road at 8:30 a.m. on Wednesday, with a welcoming speech by the symposium chairman. The actual touring will start right after the official welcome when the ladies will be carted off to Sunset Magazine. Other places of interest are the Paul Masson Winery (where they'll taste all the excellent wines), Villa Montalvo, (a real villa—once a governor's palace), Stanford University, Allied Arts Guild, and of course selected shopping centers (e.g.: The Mayfield Mall, Town and Country Village and Stanford).

All the listed places will not be visited in one day but in two days as per the schedule. Transportation will be furnished to and from all the tour sites.

Each night the ladies will be treated to drinks during cocktail hour and will have the option of attending both night functions and one day function at their own expense:

- San Francisco nitelife tour inclusive of transportation to and from San Francisco, superb cuisine, shows and drinks at Bimbo's 365 Club, Finnochio's Club and a view of the city from Top of the Mark or Crown Room all for $19.75 per person. May 3rd.
- Banquet with a noted speaker $6.50 per person. May 4th.
- Lunch with husband $4.00 per person. May 5th.

hfe symposium

HUMAN ENGINEERING MAINTAINABILITY

When the system has been specified to its basic components, and concurrent with the development of man-machine allocations, concepts relating to human engineering and maintainability are applied. These two terms reflect, to a degree, the old and the new in system development work. Human engineering as a term and as a technology, has been applied to system and subsystem development for a relatively long period of time. One may trace its origins at least to the early work of Taylor and Gilbreth at the turn of the century in their concern with early man-machine relations. Historically, human engineering probably came of age during World War II and man's first intimate interaction with complex equipment. It may be seen, therefore, to be one of the oldest disciplines in system analysis,

---

Maintainability, on the other hand, represents a relatively new concern of the system analyst. In many respects, its growth parallels the engineering development of concepts related to equipment reliability and maintainability. Since both terms are concerned generally with the human's performance with complex equipment, there may be no need to distinguish them as separate areas of concern even though they are usually concerned with the separate areas of operation and maintenance. Since in current aerospace industry practice, however, distinctions are drawn between the operation and maintenance of a system, human engineering and maintainability are often presented as separate topics.

slac news

SLAC TOPS DESIGN ENERGY

The two-mile linear electron accelerator at Stanford University has topped its design energy of 20 billion electron volts (20 GeV), project director Wolfgang K. H. Panofsky has announced. The high mark of 20.159 GeV was set at one o'clock in the morning of Jan. 10, Prof. Panofsky said.

The event is one more in a procession of achievements confirming predictions of the machine's builders at the Stanford Linear Accelerator Center.

Late last spring the 10,000-foot-long accelerator was first turned on for its full length, approximately four years from the day ground was broken for it. Last November the Stanford physicists announced that they had begun experiments at last.

Research teams made up of scientists from Stanford, MIT, Cornell, Caltech, UC-Berkeley, and the University of Washington are scheduled to do experiments during the first year. SLAC is a national facility, and is open to such use by qualified scientists from all over the world.

Now operating about 80 hours a week, the accelerator is used about half the time for experiments and half for studies of its electron beam characteristics. By next June it is expected to be 90 per cent occupied with experiments.

Present investigations are of two kinds: scattering experiments in which electrons bombard atomic nuclei to learn more about the nuclear structure; and experiments creating new particles such as "pions" and "kaons" that burst from nuclear targets under electron bombardment, and then are used in turn to bombard other targets.

Physicists study the interactions between these speeding particles and their targets minutely, hoping in the process to discover more about the structure of matter.

ieee news

1967 BOARD ELECTED

Walter K. MacAdam, vice-president, American Telephone & Telegraph Company, newly elected president of the IEEE recently announced the election by the annual assembly to the board of directors of the following:

Guillermo J. Andrews, Compania Standard Electric Argentina S.A.I.C., Buenos Aires, Argentina, regional director; Robert W. Gillette, Consolidated Edison Company, director-at-large; Dr. A. U. Lamm, Electrotechnical-Director, ASEA, San Francisco, director-at-large; Dean George R. Town, Iowa State University; Shigio Shima, SONY Corporation, Tokyo, regional director.

Elected as vice-presidents by the annual assembly held January 4 were Dr. Seymour W. Herwald, Westinghouse, and Dr. F. Karl Willenbrock, Associate Dean of Engineering and Applied Physics, Harvard University.

Dr. Bernard M. Oliver, IEEE's senior past president was elected by the annual assembly to serve in the office of secretary for 1967. Dr. John V. N. Granger was elected to hold the office of treasurer during 1967.

Mr. MacAdam, along with Hendley N. Blackmon were elected president and vice-president, respectively, in the fall of 1966 and assumed office as of January 1. Blackmon is engineering manager, association activities, Westinghouse.

The following directors also elected in the fall of 1966 assumed office on January 1:

Dr. John G. Brainerd, University of Pennsylvania, regional director. Dr. Harold Chestnut, General Electric, director-at-large. Dr. Edward E. David, Jr., Bell Telephone Laboratories, director-at-large. David M. Hodgin, Collins Radio Company, regional director. Dr. Stanley F. Kaisel, Microwave Electronics Division, Teledyne, Inc., Palo Alto, regional director. Dr. Robert C. G. Williams, Philips Electronic and Associated Industries, Ltd., London, regional director.

slac news

THYRATRON CONTRACTS

Two contracts for thyratron tubes totalling more than $600,000 have been awarded to eastern electronic manufacturers by the Stanford Linear Accelerator Center.

Wagner Electric Corp. of Newark, N.J., received a $345,000 contract for delivery of 150 tubes. International Telephone and Telegraph's Electronic Tube Division at Easton, Pa., was awarded the other contract for 100 tubes at a cost of $270,000.

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ALBUQUERQUE CONFERENCE

Having been assigned to the Albuquerque section and the Los Alamos subsection, the Sixth regional Conference will open at the Sheraton Western Skies Motor Hotel on the 9th of May, to last for three full days. It is expected that the 700-800 engineers will attend from the eleven states in the region.

The conference theme: "Frontiers of Energy Conversion", describes an area of interest for electrical engineers of all disciplines at all levels. This field is remarkably broad, with the papers to be presented running the gamut from electric automobiles to giant power distribution systems to magnetohydrodynamics.

Another feature, one which the conference committee feels is long overdue in professional meetings of this kind, is the requirement that the speakers in the technical program write and present their papers tutorially. In the age of more and more intense specialization, the technical program which clearly informs and thoroughly satisfies its audience is less easily come by than it might be. It was with the idea that both the uninitiated engineer and the sophisticate in the specialty might find such a format worthy of their time, as well as refreshingly different, that the committee decided this year upon a technical program of invited papers only. Well-known engineers and physicists, apt in their specialties and skilled at communicating with a mixed audience, have been asked to address tutorially some facet of the

(Continued on page 16)

Region 6 technical program chairman Dr. Otmar Stuetzer, general chairman Tom Pace, and vice-chairman Dan Hardin, from left to right.

1967 IEEE region six annual conference

frontiers of energy conversion

TUESDAY 5/9

Registration

Keynote Address:

The Honorable Frank Thomas, Assistant DDR&E
"Nuclear Projects"

Luncheon:

The Honorable David F. Cargo, Governor of New Mexico

2:00 to 4:00 P.M.

Progress Report on "Sherwood"
Dr. J. L. Tuck

Nuclear Reactor Development
Dr. D. B. Hall

Nuclear Rockets: The Rover-Phoebus Program
Dr. R. W. Spence

Public Service Co. Tour

WEDNESDAY 5/10

9:30 to 11:30 A. M.

Piezoelectric and Ferroelectric Energy Conversion
D. A. Berlincourt

Radioisotope Power Sources
Dr. W. J. Levedahl

Biological Sources for Heat and Electricity
Dr. H. P. Silverman

LUNCH

2:00 to 4:30 P.M.

Problems of Giant Power Systems
W. R. Gould

Project "Gasbuggy"
B. R. Howell

New Techniques for Electromechanical Energy Conversion Analysis
Dr. E. A. Erdélyi

Advanced Power Sources for Electrical Automobiles
Dr. M. Altman

Los Alamos Tour

6:00 P.M.—Social Hour

Kirtland Tour

THURSDAY 5/11

9:30 to 11:30 A.M.

Explosive Electromagnetic Power Generators
Dr. C. M. Fowler

Magnetohydrodynamic Power Generators
T. R. Brogan

The Harnessed Electric Wind
Dr. M. C. Gourdine

LUNCH

2:00 to 4:00 P.M.

Fuel Cells
Dr. J. O'M. Bockris

Thermoelectric Conversion
Dr. E. F. Hockings

Thermionic Energy Conversion
Dr. L. W. Zelby

Sandia Corp. Tour

150 MHz, 2.4ns

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The Tektronix Type 454 is an advanced new portable oscilloscope with DC-to-150 MHz bandwidth and 2.4-ns risetime performance where you use it—at the probe tip. It is designed to let you make convenient measurements of fast-rise pulses and high-frequency signals previously outside the range of conventional oscilloscopes.

The Type 454 is a complete instrument package with dual-trace vertical, high-performance triggering, 5-ns/div delayed sweep and solid-state design, all in a rugged 31-lb. instrument. You also can make 1 mV/div single-trace measurements and 5 mV/div X-Y measurements with the Type 454.

The 2.4-ns risetime and DC-to-150 MHz bandwidth are specified at the tip of the new miniature P6047 10X Attenuator Probe. The dual-trace amplifiers provide the following capabilities with or without probes:

*Deflection Factor**	*Risetime*	*Bandwidth*
20 mV to 10 V/div	2.4 ns	DC to 150 MHz
10 mV/div	3.5 ns	DC to 100 MHz
5 mV/div	5.9 ns	DC to 60 MHz

*Front panel reading. Deflection factor with P6047 is 10X panel reading.

The Type 454 features a new CRT with distributed vertical deflection plates and a 14-kV accelerating potential. It has a 6 by 10 div (0.8 cm/div) viewing area, a bright P-31 phosphor and an illuminated, no-parallax, internal graticule. The Type C-30 and the New Type C-40 (high writing speed) cameras mount directly on the oscilloscope.

The instrument can trigger to above 150 MHz internally, and provides 5-ns/div sweep speeds in either normal or delayed sweep operation. The calibrated sweep range is from 50 ns/div to 5 s/div, extending to 5 ns/div with the X10 magnifier. Calibrated delay range is from 1 μs to 50 seconds.

The Type 454 is designed to be carried and has the rugged environmental characteristics required of a portable instrument. A rackmount, the 7-inch-high Type R454 oscilloscope, is available with the same high performance features. Also available is the new Type 200-1 Scope-Mobile® Cart.

For further information about the Type 454, or about the new Tektronix DC-to-100 MHz *plug-in* oscilloscope, the Type 647A, contact your nearby Tektronix field engineer, or write: Tektronix, Inc., P. O. Box 500, Beaverton, Oregon 97005.

Type 454 (complete with 2 P6047 Probes and accessories)	$2550
Type R454 (complete with 2 P6047 Probes and accessories)	$2635
C-30 Camera	$ 390
C-40 Camera	$ 540
Type 200-1 Scope-Mobile® Cart	$ 60

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meeting ahead

PIONEER'S NIGHT

Bay Area electronics and electrical engineering pioneers will be honored on April 7, when the San Francisco Section and Santa Clara Valley Subsection co-sponsor a dinner meeting at Foothill College, in cooperation with the college and the Perham Foundation. Dinner in the main dining room of the Foothill Student Center ($3.50) will be served at 6:30, followed by a program and tours of the planetarium, observatory and OSCAR project. These facilities and the Foothill Electronics Museum, being planned by the college and the Perham Foundation to house the famous Perham collection, will be the focal point of a new space science center developing on the campus.

Waterman

Cox

meeting ahead

TROPOSCATTER

Lecture No. 3 in the Antennas & Propagation chapter tutorial series on tropospheric propagation effects will be presented April 18.

The present status of knowledge on the propagation of microwaves to distances beyond the horizon—troposcatter—will be the subject of a talk by Professor A. T. Waterman, Jr. and Donald C. Cox of Stanford University. The presentation will review the basic characteristics of this type of propagation: signal levels encountered, statistical distribution of signal level, fading ranges and rates, space-, frequency- and angle-diversity, and the concept of effective antenna gain. Alternative theories on the mechanism of propagation will be summarized along with their ability to account for the observed phenomena. Data from various experiments, including some at Stanford, will be shown and discussed in the light of their consistency with theoretical models and of their implications regarding the structure of refractive index distribution in the atmosphere.

Professor Waterman received his undergraduate training at Princeton University in physics and his PhD from Harvard University in engineering sciences and applied physics. He is past chairman of the Antennas and Propa-

(Continued on page 20)

APRIL 7, FRIDAY, 7:30 PM — San Francisco Section/Santa Clara Valley Subsection

Annual Pioneers' Night: IEEE members, families and friends

Highlights of Section anniversaries, the Perham Foundation and Foothill Electronic Museum, followed by open house tours and planetarium show

Place: Foothill College, 12345 S. El Monte Ave., Los Altos Hills
Dinner: 6:30 PM, Main dining room of Foothill Student Center, $3.50
Reservations: Mrs. Helmke (Section office) 327-6622 or in San Francisco: 433-4567 ext. 3351
8:30 Planetarium show limited to 120 persons who make reservations when their dinner tickets are purchased

APRIL 11, TUESDAY, 7:30 PM — Power

Building the PG&E 500-KV transmission system

Charles H. Sedam, vice president, general construction, PG&E Co., San Francisco

Place: Engineers' Club of San Francisco, Pine & Sansome Streets
Cocktails: 5:30 PM
Dinner: 6:30 PM
Reservations: Engineers' Club - GA 1-3184

APRIL 13, THURSDAY, 7:30 PM — Industry & General Applications

Tour of Hunters Point Naval Shipyard

Place: Main gate (from Army Street, find Fairfax, travel east and follow the signs)
Reservations: limit of 30; phone 654-7120, Mrs. Korey by 5 PM, Apr. 13

APRIL 18, TUESDAY, 8:00 PM — Antennas & Propagation

Tutorial Series on tropospheric propagation

Lecture no. 3: *Transhorizon propagation effects*
Dr. A. T. Waterman, Jr., professor at Stanford University and Don Cox, research assistant, Stanford University
Lecture no. 4: *May 16, Dr. Glenn Keitel, head, EE Dept., San Jose State College Subject: Tropospheric earth-space effects.*
Place: Lockheed Auditorium, Bldg. 202, 3251 Hanover St., Palo Alto
Dinner: 6:00 PM, Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto
Reservations: W. K. Chang, 591-1414 ext. 223

APRIL 18, TUESDAY, 8:00 PM — Automatic Control

Some methods for the design of linear and nonlinear sampled-data feedback control systems

Dr. Gunther Schmidt, lecturer, Technische Hochschule of Darmstadt, Germany (on leave to Stanford University for 1967)

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

APRIL 18, TUESDAY, 8:00 PM — Engineering in Medicine & Biology

Panel discussion: The monitoring of acutely ill patients

E. C. Boycks, Ph.D., research scientist, Beckman Instruments, Inc.; Alfred P. Spivack, M.D., director, coronary care unit, Palo Alto-Stanford Medical Center; Charles Whitcher, M.D., assistant professor of anesthesia, Stanford University; Thomas Corbin, Vice Pres., Corbin-Farnsworth, Inc.

Place: Room M 112, Stanford Medical School
Dinner: 6:15 PM, Red Cottage, El Camino, Menlo Park
Reservations: Dr. Noel P. Thompson, 326-8120 by 5 PM, Apr. 17

APRIL 19, WEDNESDAY, 8:00 PM — Reliability/Engineering Management

Cost effective design management

E. S. Winlund, cost effectiveness management planning, Douglas Aircraft, Santa Monica

Place: Ph 101, Stanford
Dinner: 6:30 PM, Stanford View Restaurant, 1921 El Camino; $2.75 barbeque chicken or barbeque steak (incl. tax & tip)
Reservations: Sylvania (Terri Beall) 966-3342 or 966-3653 by Apr. 17

Sedam

Schmidt

meeting ahead

THE PG&E 500-KV

Charles H. Sedam, vice-president, general construction, Pacific Gas & Electric Company, will discuss the PG &E 500-kv construction program at the April 11 meeting of the Power chapter.

The Pacific Northwest-Southwest Intertie will be the biggest electrical transmission program ever undertaken in this country and will transmit surplus hydroelectric energy from the northwest to the southwest. The PG&E "link", consisting of 1,025 miles 500-kv lines and of 7 substations, will also serve as a system "backbone". Started in 1964, the first PG&E line will be energized at 500-kv in a few months.

PG&E is the only utility presently building 500-kv electrical facilities by the use of company personnel. Mr. Sedam, who heads the construction of the mammoth project, will give a first-hand account of some of the many unique construction problems, some of the cost data, and the present status of the program.

Mr. Sedam, a member of IEEE since his University of Washington days where he was graduated in 1940, first worked for Puget Sound Power & Light Company, before joining PG&E in 1941 as an electrician's helper. He has had numerous assignments prior to his election to vice president, general construction in 1964. He is a director and a member of the executive committee of the San Francisco Section.

APRIL 24, MONDAY, 7:30 PM — East Bay Subsection

Communications for tomorrow

G. A. Nielsen, toll equipment engineer, PTT

Place: PG&E service center, 4801 Oakport, Oakland, west of Nimitz Freeway, between High & Hegenberger

No. dinner

APRIL 25, TUESDAY, 8:00 PM — Computer

Computer activities at LRL, Livermore

Dr. Sidney Fernbach, head, theoretical and computations div., LRL

Place: Room 134 McCullough Bldg., Stanford University

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

Reservations: Mrs. Chrisjensen, 324-3311 ext. 45034 by noon Apr. 24

APRIL 26, WEDNESDAY, 8:00 PM — Electromagnetic Compatibility

RFI/EMC measurements with the spectrum analyzer

Rod Carlson, manager of signal analysis section, Hewlett-Packard microwave lab

Place: Hewlett-Packard Co., 1501 Page Mill Rd., Palo Alto, room 5 M (ask for directions at main lobby)

Dinner: 6:00 PM, Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto

Reservations: E. R. Isacson, 867-3912 by Apr. 24

APRIL 27, THURSDAY, 8:00 PM — Aerospace & Electronic Systems

Pioneer VI observations of the interplanetary solar wind ion and electron characteristics

J. H. Wolfe, PhD, space sciences div., NASA

Place: Lockheed auditorium, Bldg. 202, 3251 Hanover St., Palo Alto

No dinner

JUNE 7, WEDNESDAY, 8:00 PM — San Francisco Section/All Subsections and Chapters, ladies night

Annual meeting honoring 1967 Fellows; installation of 1967-68 Section Officers

Speaker to be announced

Place: The Bold Knight, 769 No. Mathilda Ave., Sunnyvale (2 blocks west of Bayshore)

Social hour: 6:00 PM (refreshments 65c)

Dinner: 7:00 PM - roast sirloin of beef, $4.50 incl. tax & tip

Reservations: Mrs. Jean Helmke, Section Office, 327-6622 by June 5

Tables of six or more may be reserved for Subsections, Chapters, Committees and Companies

meeting ahead

FEEDBACK CONTROL

Dr. Gunther Schmidt, lecturer, Technische Hochschule of Darmstadt, Darmstadt, Germany will discuss some methods for the design of linear and non-linear sampled-data feedback control systems at the April 18 meeting of the Automatic Control chapter.

During the recent years the control group of the Technische Hochschule of Darmstadt, with Dr. -Ing. W. Oppelt as its director, has developed some simple methods for the design of sampled-data feedback control systems. The talk will give a short survey of these methods, including the following topics:

- Stability analysis and synthesis of linear and nonlinear sampled-data control systems by means of a describing function method;
- synthesis of sampled-data feedback control systems with finite settling time in the time-domain. Development of simple standard controls for higher order plants; and
- design of finite settling time systems with minimal parameter sensitivity.

Dr. Schmidt holds Dipolm-Ingenieur degree and Doktor-Ingenieur degree. He has been a teaching assistant, a research engineer and a consultant. During 1967 he is visiting Stanford.

meeting ahead

SHIPYARD TOUR

The Industry & General Applications chapter will tour the electrical and electronic facilities at the San Francisco Bay Naval Shipyard at Hunters Point on April 13. The tour will be conducted by a member of the shipyard design division and is limited to 30 members.

meeting ahead

MONITORING THE ILL

The program of the Engineering in Medicine & Biology chapter on April 18, will consist of a panel discussion on the monitoring of acutely ill patients.

Speakers on the panel will be: E. C. Boycks, Ph.D., research scientist, Beckmann Instruments, Inc., Thomas Corbin, vice-president, Corbin-Farnsworth, Inc.; Alfred P. Spivack, M.D., director, coronary care unit, Palo Alto-Stanford Medical Center; and Charles Whitcher, M.D., assistant professor of anesthesia, Stanford University.

The panel will discuss the capabilities as well as the problems of current patient monitoring systems. Notice will be made of past experience, present state of the art, and potential future developments. Audience participation will be encouraged.

Winlund

Fernbach

meeting ahead

COST/DESIGN

Cost effective design management will be discussed at the April 19 joint meeting of the Reliability and Engineering Management chapters by E. S. Winlund of Douglas Aircraft.

Mr. Winlund is responsible for the development of cost-effectiveness management planning for the missile & space systems division. This involves technical and management integration of the "effectiveness" disciplines, — reliability, maintainability, safety, etc., — with performance, delivery, and total cost.

The history of military system procurement shows that schedule, reliability, and cost have commonly missed initial commitments by substantial margins. Many "remedies" have been applied to these effects, but seldom to causes. Parochial approaches have achieved gains for each parish, but often at reduced overall system effectiveness

(Continued on page 20)

meeting ahead

LRL COMPUTERS

Computer activities at Lawrence Radiation Laboratory, Livermore, will be described to the Computer chapter on April 25 by Dr. Sidney Fernbach, LRL computation division head.

The Lawrence Radiation Laboratory at Livermore for many years has been involved in the use of digitial computers in the solution of formidable mathematical problems. The ever-growing desire to get better solutions has put the laboratory in the forefront of computer development; the number and size of the computers at the laboratory are constantly growing. To achieve better utilization of the equipment, as well as to provide improved turn-around-time for the scientists, a time-sharing system has been put into use. At the moment it is centered in a CDC 6600. Within the next year, it will be considerably expanded. The existing system and future plans will be described.

Dr. Fernbach has been with the Lawrence Radiation Laboratory since 1948 and head of the theoretical and computation divisions since 1958. His major area of interest is theoretical physics, with special emphasis on neutron physics, cosmic ray shower theory, and application of computers to physics.

meeting ahead

SPECTRUM ANALYZERS

Rod Carlson of Hewlett Packard will discuss recently developed methods for utilizing spectrum analyzers for making RFI/EMC measurements at the April 26 meeting of the Electromagnetic Compatibility chapter.

Present RFI/EMC measurements are made using manually-tuned receivers having meter readouts. Several receivers or plug-ins are necessary to cover the wide frequency range required. This measurement method is slow and affords a rather restricted view of the interference signal spectrum present. Some improvement has been made by using motor-driven tuning of the receivers and recording the output on X-Y recorders, but the spectrum analyzer promises a step beyond this.

The spectrum analyzer is an electrically swept-tuned receiver that displays its output, a plot of signal amplitude versus frequency, on a cathode ray tube (CRT). The modern, wide-scan spectrum analyzer, with accessories, can cover the broad frequency range from 10 kHz to beyond 12 GHz and can display signals over 2 GHz wide segments of this range on its CRT.

An advantage of using the analyzer in EMC work is the immediate "wide angle" view on the CRT that one gets of the frequency range under observation. Another is that the frequency range under observation may be very wide, up to 2 GHz at present. A third is that the spectral display is very useful in identifying the type of interference signal present, for instance in distinguishing CW, modulated CW, pulsed RF, and impulse noise signals.

The spectrum analyzer has some disadvantages. The CRT display by its character reduces the ability to distinguish a weak signal from the residual noise by 5 to 10 dB. Below 2 GHz large inputs can cause spurious responses. The latter is not inherent in the spectrum analyzer but is due to the present-day lack of an electrically swept means of preselection in this range. Recent developments have significantly reduced some of these limitations. The variable persistance CRT allows slow scanning without flicker permitting increased sensitivity and gives a much improved display of impulse interference signals. X-Y recordings can be made at the output to obtain greater sensitivity as well as a means, in addition to CRT photographs, of obtaining a permanent record of the interference spectrum. The electrically-swept YIG preselector greatly reduces spurious responses above 2 GHz.

Rod Carlson is manager of the signal analysis section of the Hewlett-Packard microwave laboratory. This section is concerned with the development of wave and spectrum analyzers, broadband detectors, and power meters.

He graduated in electrical engineering from Cornell University and then spent five years as an instrumentation engineer in the flight research department of the Cornell aeronautical laboratory engaged in the measurement of aircraft stability characteristics under actual flight conditions.

Carlson

Nielsen

meeting ahead

COMMUNICATIONS FOR FUTURE

G. A. Nielsen, toll equipment engineer, PT&T, will discuss communications for tomorrow at the April 24 meeting of the East Bay Subsection.

From the bottom of the ocean to the outer limits of space, progress is being made in the telephone industry. Communications via satellites is a reality. Amplifiers designed to rest on the bottom of the ocean for twenty years without maintenence have made transoceanic telephone cable economical. Computers now talk to each other and to humans over telephone circuits to reserve your plane ticket, design electrical equipment and even make out your paycheck.

Mr. Nielsen will discuss these and other developments of interest to our membership. His talk is not highly technical. Interesting current and future developments in communications are covered. Mr. Nielsen's talk gives you an unusual opportunity to hear the latest in communication technology.

Mr. Nielsen is a graduate of the University of California. He has studied advanced communications and data transmission systems extensively. He is experienced in transmission design, planning and programming communications networks and is a senior member of IEEE.

Engineers Joint Council's Kiely Panel Report: "Assessment of the Goals of Engineering Education in the United States" is available at $1 a copy from EJC, Dept. P, 345 E. 47th St., New York, N. Y. 10017. It touches upon controversial 1965 recommendations of the Goals of Engineering Education Committee operating through the American Society for Engineering Education.

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meeting ahead

PIONEER VI

Pioneer VI observations of the interplanetary solar wind ion and electron characteristics will be discussed at the April 27 meeting of the Aerospace & Electronic Systems chapter by Dr. J.H. Wolfe of the space sciences division of NASA-Ames Research Center.

Recent data on the plasma characteristics in the interplanetary medium as observed by the Ames Research Center plasma probe on Pioneer VI will be presented. The results show that the solar wind ions deviate at times from solar radial flow by as much as five degrees. The observation of the plasma ions in a reference frame comoving with the solar wind convective velocity indicates that generally the ion temperature parallel to the local magnetic field exceeds the perpendicular temperature and that this thermal anisotropy is field aligned. Evidence will be presented which supports the presence of a third ionic species in the solar wind. This species has been tentatively identified as singly charged helium.

Interplanetary solar wind ion and electron data will be presented for conditions of solar quiet and the interplanetary data compared to the plasma ion and electron characteristics in the geomagnetosheath during its traversal by Pioneer VI. The data reveal an interplanetary solar wind electron temperature on the order of 1-2 x 10^5 °K during quiet times when the solar wind velocity was approximately 290 km/sec with a maximum ion temperature on the order of 5 x 10^4 °K. The passage of Pioneer VI through the geomagnetosheath shows that the solar wind electrons are heated at the earth's bow shock to a temperature of approximately 5 x 10^5 °K and subsequently cool by about a factor of two as the flow proceeds downstream. The solar wind ions, on the other hand, although also heated at the shock front, do not appear to cool downstream and in addition reveal nonthermal characteristics. During quiet times the interplanetary data show that the electrons are somewhat hotter than the ions, wheras in the geomagnetosheath the ion and electron temperatures are more nearly equal. When the interplanetary medium becomes more distrubed both ion and electron temperatures are observed to increase together with increases in the solar wind velocity and density. Plasma data obtained from Pioneer VI will be compared for various degrees of solar activity.

The IEEE Executive Committee has ruled that hereafter Student Branch Counselors must be IEEE members.

wescon news

MICROELECTRONICS SYMPOSIUM

A second two-day technical symposium has been added to WESCON's August program in San Francisco, according to John C. Beckett, Hewlett-Packard Co., convention director.

"Microelectronics Comes of Age," a concentrated program of 28 papers proposed by the IEEE/PMP group, has been accepted by WESCON's directors and scheduled for Wednesday and Thursday, August 23 and 24. S. M. Stuhlbarg, Raytheon Co., Bedford, Mass., will be general chairman of the symposium.

WESCON will also present the Eighth International Electronic Circuit Packaging Symposium in San Francisco on August 22 and 23, the two days immediately preceding the microelectronics meeting.

"We have scheduled these two important symposia back-to-back because we are certain many engineers will want to participate in both of them," Beckett said. Each symposium will have a registration fee of $25. In each case, the fee includes one luncheon event. The IECP fee also includes a copy of the symposium record, but publication of the microelectronics symposium record has not yet been decided.

"Microelectronics Comes of Age" will be a concentrated adaptation of a highly successful eight-week course presented by the Boston IEEE/PMP group last Fall under Stuhlbarg's chairmanship. The list of speakers and topics is still being formulated for the WESCON program, although Stuhlbarg indicated a number of the original "faculty members" will participate.

The two symposia will supplement WESCON's own technical program, also presently being formulated, which will be made up of 16 contributed sessions under the "session unit" plan, and four special, invited sessions.

Both symposia and advance details on the WESCON technical program will be featured in the July issue of the IEEE Grid-Bulletin.

ieee news

JOURNAL FOUNDER HONORED

The IEEE Board of Directors has voted presentation of a plaque at the directors' reception during the March convention to Ted A. Hunter, who founded, and after 13 years is retiring as editor of, the *IEEE Student Journal.*

A two-page "Guidelines Concerning the Hosting of Visitors" has been issued by Headquarters as an aid to IEEE members receiving engineers from abroad. Write J. M. Kinn for a free copy.

aerospace news

SANTA CLARA SYMPOSIUM

Problems of aerospace mechanisms will be the focus of a two-day symposium at the University of Santa Clara on May 4 and 5. More than 250 engineers and scientists will gather for this second annual session, the only one of its kind in the country. Tri-sponsored by the University, Jet Propulsion Laboratory and Lockheed Missiles and Space Co., the symposium will include 20 papers, chosen specifically for presentation at the meetings.

Although most of the papers will describe flight-proven mechanisms, the symposium committee also has encouraged papers on flight and development failures. "They are often more valuable than reports of successful efforts since they prevent others from following blind alleys and making costly mistakes," said the chairman, Dr. George Herzl of Lockheed.

Other members of the paper review board and symposium committee include: Alfred L. Rinaldo of Lockheed; Dr. James L. Adams of Stanford University; Dr. William J. Schimandle and Dr. Peter T. Lyman of Jet Propulsion Laboratory; and Dr. Stein Weissenberger and Richard K. Pefley of University of Santa Clara.

MORE REGIONAL CONFERENCE

energy conversion field, and thereby bring to each attending engineer—and university student guest—a measure of understanding; even of enthusiasm.

The conference will convene with a keynote session on the morning of the 9th and will consist of some five technical sessions during which the twenty or more invited papers will be presented. The keynote session will feature as speaker, Frank J. Thomas, assistant director of defense research and engineering, nuclear programs.

Following this session will be the conference luncheon, highlighted by a welcoming speech from David F. Cargo, governor of New Mexico. The first technical session will follow in the afternoon and will be held at the nearby Holiday Inn, as will the remaining four sessions. Continuous shuttle bus service will eliminate transportation problems between the two hotels.

The five technical sessions will be held in sequence so that no presentation will conflict with another.

On May 10th the sub-regional student paper winners will participate in the regional student paper competition.

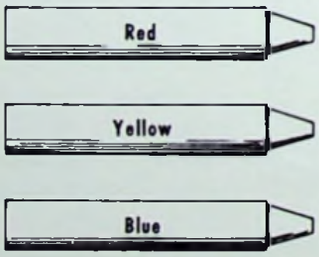
The conference registration fee will be $3.00 for IEEE members and $5.00 for non-members. Pre-registrants will receive a free ticket, normally $3.00, to the social hour.

A commercial exhibit area has been arranged at the Western Skies, where about 25 exhibitors will have booths displaying the latest items in the various lines.

For the non-technical aspects of the conference, a social event has been planned, along with activities for the ladies, and conducted tours for the attendees and their wives.

General chairman of the conference is T. L. Pace, K. D. Hardin is vice-chairman and R. C. Cainski is secretary. P. Rudnick, E. L. Amonette and Dr. A. H. Koschman are the committee's advisors, with Dr. O. M. Stuetzer handling the technical program. T. M. Tinkle is the finance chairman, C. H. Schmidt the exhibits chairman, and Maj. E. E. Pace the chairman of tours. Rounding out the committee are the chairmen of arrangements, V. V. Myers; student activities, Dr. L. T. Boatwright; ladies activities, Mr. C. H. Schmidt; and publicity and public relations, L. J. Seligman.

The only non-stop air service from San Francisco to Albuquerque is offered by TWA on a flight departing at 4:30 p.m. and arriving at 7:30 p.m. Section members departing on May 8 can qualify for an excursion round trip fare of $95.10, a saving of $30.90, providing they return Thursday night or Friday morning or after noon on Saturday. Two one-stop flights are also offered at 5:45 p.m. and 6:05 p.m. For further information call 321-5496 or any TWA ticket office.

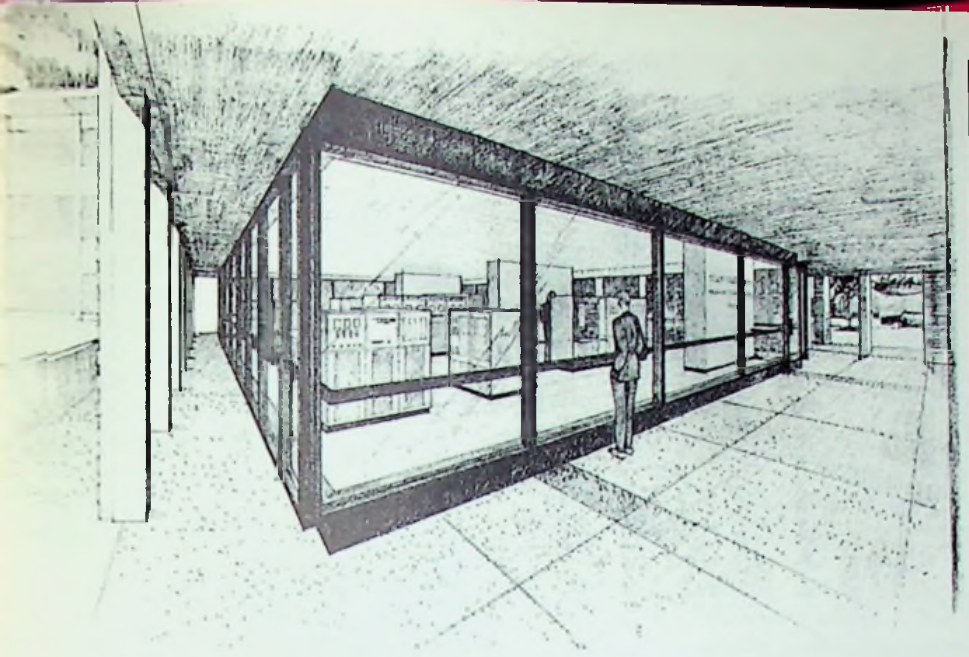


DESIGN PATENT FOR THE PRODUCTION OF A COMPATIBLE COLOR PICTURE ON A MONOCHROMATIC TELEVISION PICTURE TUBE.

chapter news

ATHENS CHARTER FLIGHT

A west coast charter flight to the 1967 International Symposium on Information Theory, Sept. 11-15, Athens, Greece, has been arranged to leave Los Angeles on Sept. 9 for London and return from Paris to Los Angeles on October 1. The flight will be via World Airways (Boeing 707-320C Jet) and is open to all IEEE members and families. The round-trip fare is approximately $345 per seat. Connecting flights to and from Athens are being arranged. For additional details write: IEEE Flight Chairman, Los Angeles Council, IEEE, 3600 Wilshire Blvd., Los Angeles, Calif. 90005. Tel: (213) 387-1203.



Artist's sketch shows glass enclosed computer facility. Easily visible to visitors, the machine will be located in the breezeway between the Stanford University School of Medicine and the clinical sciences research buildings.

computer news

MED SCHOOL COMPUTER CONTRACTS AWARDED

Stanford University has awarded a $839,120 contract for construction of special housing for the medical research computer to Harrod and Williams, Inc., general contractors of Sunnyvale.

The powerful and versatile computer—an IBM 360/50— is being installed at the school of medicine to help doctors diagnose disease and explore new avenues of medical computer research.

The computer will be located in an 11,800 sq. ft. glass enclosure in the breezeway between the medical school and the clinical sciences research building, and will be easily visible to visitors while in operation. The enclosure will be equipped with acoustic tile, and special ventilating and air conditioning

When it has been fully developed after three years and a cost of about $1.5 million, the computer will provide a compendium of medical knowledge far too great for any individual physician or researcher to keep in his mind, according to Dr. Robert J. Glaser, vice president for medical affairs and dean of the school of medicine.

The computer will analyze many experimental results from many different laboratories simultaneously. It will also process data from medical instruments hooked up to patients, enabling doctors to monitor critical body functions more accurately during surgery or acute illness.

Dr. Joshua Lederberg, Nobel prize winning geneticist and professor and head of the department of genetics, is the responsible investigator. He heads a committee of scientists from key medical school departments and the Stanford computation center.

The new computer is being financed by grants from the National Institutes of Health and was planned with funds from the Josiah Macy, Jr. Foundation.

Architect for the project is Milton T. Pflueger of San Francisco.

IT IS REPORTED:

Energy Systems, Inc., Palo Alto, has received a subcontract award from Philco-Ford Corp.'s WDL division for five additional high power amplifiers for the Air Force space systems division, the contract in excess of $550,000. ESI has built most of the very large radars in the world and is currently building one more in this series, the ALTAIR. The company also has an impressive list of accomplishments in the space program: Lunar Orbit, Mariner, and Apollo were all guided by a transmitter designed and built by ESI.

James W. Baer has joined Friden, the business machines division of the Singer Co., in the newly-created post of director of employee relations.

Philip R. Samwell, chairman of the board, and James A. Trainor, executive vice-president of Friden have announced their retirement but will remain on the boards of Friden and Singer.

Newman

Butler

Bertram R. Newman, former president of Clavier Corp., New York, and planning advisor to the Royce Corp., Cambridge, has been appointed planning coordinator and manager of shareowner relations for Watkins-Johnson, Palo Alto. He also served as director of marketing for Whittaker Corp.'s electronics division, Los Angeles.

Applied Technology, Inc., has been awarded a $1,768,000 contract by the U.S. Air Force for electronic equipment for the B-52 series, bringing the firm's backlog to an all-time high of $26 million.

William H. Butler has been appointed to the newly created position of product manager, closed-circuit television tapes, Memorex Corp., Santa Clara.

American Micro-systems, Inc., Santa Clara, was recently founded to specialize in MOS and other advanced technology. Principals are Howard S. Bobb, president and chairman of the board; Warren Wheeler, vice president-semiconductor operations; William Vallandigham, vice-president-general operations; and V. E. Peterson, vice-president-financial operations. More than $1 million has been invested in the company by a Bank of America subsidiary. The firm is the 11th integrated circuit manufacturer to locate in Santa Clara County.

Frank Newman, former manager of the Berkeley division of Beckman Instruments and former engineering executive with Shockley Transistor Corp. and Minneapolis-Honeywell, has been named associate general secretary at Stanford University, reporting to Daryl Pearson, general secretary of the university.

Manufacturer / Representative Index

D. Data Systems .... W. K. Geist Co.
...tronics, Inc. .... Frauman Associates
...tech .... Jay Stone & Assoc.
...eed Dynamics, Inc. .... J. D. Kennedy Co.
...eed Microwave Laboratories .... Jay Stone
...ciated Testing Labs .... Dietrich-Heffner
..., Inc. .... V. T. Rupp Co.

...kman/Computer Operations .... V. T. Rupp Co.
...man/Invar Electronics .... T. Louis Snitzer Co.
...s Built-Instruments .... Dietrich-Heffner Assoc.
...ton Electronics Corp. .... W. K. Geist Co.
...d-Rex Div. of
American Enka Corp. .... L & M Engineering

...ga Corporation .... Jay Stone & Assoc.
...tury Electronics
& Instruments .... T. Louis Snitzer Co.
...puter Instruments Corp. .... Bill Coe & Assoc.
...puter Test Corporation .... King Engineering
...om Materials, Inc. .... Jay Stone & Assoc.
...tronics, Inc. .... Data Associates

... Instruments .... W. K. Geist Co.
...pulse, Inc. .... O'Halloran Assoc.
... Technology Corp. .... T. Louis Snitzer Co.
...ectric Products Eng. Co. .... Jay Stone & Assoc.
...tronics Corp. .... Components Sales Calif.
...amic System Electronics Corp. .... King Engineering

...rado Electronics .... T. Louis Snitzer Co.
...ctro Cube Inc. .... Nickerson-Gray & Assoc.
...ctronic Engineering Co. .... Data Associates
...ctro Products Labs, Inc. .... King Engineering
...ctro Switch Corp. .... Willard Nott & Co.
...r Corp. .... V. T. Rupp Co.
...co, Inc. .... V. T. Rupp Co.
...r-Borg-Warner Corp. .... T. Louis Snitzer Co.
... Gencom Div., Whittaker Corp. .... O'Halloran Assoc.
...y Laboratory, Inc. .... W. K. Geist Co.

...and Controls, Inc. .... W. K. Geist Co.
...ohm Corp. .... Walter Associates

...eral Computers .... V. T. Rupp Co.
...eral Resistance, Inc. .... W. K. Geist Co.
...sco Systems, Inc. .... King Engineering
...bos Microwave .... Walter Assoc.
...hill, Inc. .... Nickerson-Gray & Assoc.
...dline Instruments .... T. Louis Snitzer Co.

...mark Standards, Inc. .... T. Louis Snitzer Co.
... Instruments Laboratories .... W. K. Geist Co.
...ston Omnigraphic Corp. .... V. T. Rupp Co.
...ard Industries .... Nickerson-Gray & Assoc.

...d Testing Laboratories .... W. K. Geist Co.
...rcontinental Instruments Inc. .... T. Louis Snitzer

Kepco, Inc. .... V. T. Rupp Co.
Kilovolt Corp. .... Dietrich-Heffner
Korad Corp. .... O'Halloran Assoc.

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

Nanofast .... Dietrich-Heffner
Nanosecond Systems .... V. T. Rupp Co.
Narda Microwave Corp. .... O'Halloran Assoc.
NH Research, Inc. .... W. K. Geist Co.
The Nortronics Co. .... Nickerson-Gray & Assoc.

Omni Spectra Inc. .... Walter Associates
Optimax Corp. .... W. K. Geist Co.

Pastoriza Electronics .... W. K. Geist Co.
PRD Electronics .... T. Louis Snitzer Co.
Polarad Electronic Instruments .... T. Louis Snitzer
Precision Mechanisms Corp. .... Components Sales
Princeton Applied Research .... O'Halloran Assoc.

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

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

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

Taylormade Laboratories .... Data Associates
Technipower, Inc. .... Dietrich-Heffner Assoc.
Telonic Instruments & Eng. .... T. Louis Snitzer Co.
Test Equipment Corp. .... W. K. Geist Co.
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chapter news

POWER COURSE SELLOUT

The response to the announcement in the February Grid concerning the lecture series on grounding principles was so overwhelming that, despite the offering of a second parallel course, over one hundred applicants were not able to be accommodated. Over two hundred and twenty engineers applied, but due to meeting room limitations, and the desire to limit the size of each class so as to promote group discussions, only 55 could be accommodated at one time. Through the efforts of Joel Kitchens, chairman of the Power chapter's professional education committee, and Bill Slimak, coordinator for the course, a second course was scheduled to start two weeks after the first one. The lecturers all agreed to a second session, and Hilton Brown of IBM came through with a second meeting room. Selection of the applicants was made on a first come, first served basis, and notices were mailed to all applicants. It is anticipated that the course will be offered again either in the fall or next spring.

Due to the enthusiastic response to their first lecture series, the Power Chapter is planning to offer other courses in practical engineering subjects in the future.

MORE COST/DESIGN

per dollar spent. We need much better balance between the approaches, according to Mr. Winlund.

Analytical balance is obtained by modeling effectiveness as a function of performance, reliability, maintainability, delivery, etc. in relation to total cost as design progresses. Design alternatives must be chosen on the basis of consequent system cost-effectiveness.

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Such choice automatically establishes optimal levels of performance, reliability, etc., and justifies a level of "ility" funding.

MORE TROPOSCATTER

gation administrative committee and a Fellow of the IEEE. Mr. Cox is completing his graduate research toward a PhD at Stanford in the field of trans-horizon propagation.

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Designs a wide variety of transceiver circuits and equipment. Assumes responsibility for the coordination and technical direction of small projects (1 to 5 engineers). Has thorough grasp of equipment and circuit design, including RF, nonlinear, and simple digital circuits. Makes significant individual contributions to the more difficult design problems. Assists in preparation of estimates and proposals for future work. Significant design capability in most of the following areas: RF circuits, modulation theory, information theory, feedback techniques, digital circuits, voltage tuning techniques, mixer and detector design, and environmental resistance. MSEE or BSEE required: 5 to 10 years of progressively maturing circuit and equipment design experience. Proven high level technical competence in equipment design areas mentioned above.

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Contact Mark Rosenfeld, P.O. Box 188-S, Mountain View, California

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