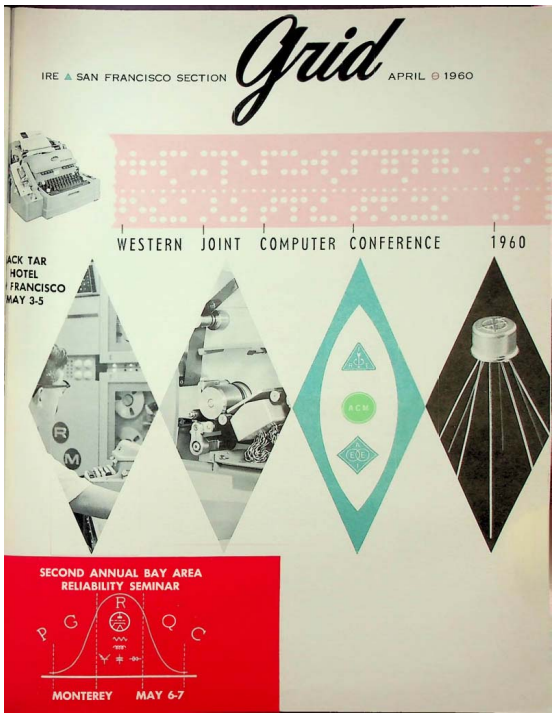
EDITOR'S PROFILE of this issue

from a historical perspective …

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

April, 1960:



Cover: Shown are several of the products that will be discussed at the Western Joint Computer Conference; for those who still can read punched-tape ASCII, the code in the 7-punch tape (near the top) spells out the conference name. The 8-lead device at the right is Fairchild's new 20 Mc (MHz) flipflop.

Page 6: Doug Engelbart (of "The Mother of All Demos" at the end of the decade) writes an editorial forecasting that information systems (and the computers being developed by members of the IRE Group on Electronic Computers, of which he is chair) will take over 95% of the daily tasks we do now. One session at the upcoming WJCC addresses social implications of micro-electronics. I sat behind Doug at an event perhaps a dozen years ago, at the Computer History Museum; I had never realized how tall he was!

Page 10: Gene Amdahl is a panelist in the first session of WJCC, on computer organization trends, covering ways that computers may affect our civilization in this decade. Gene had left IBM 5 years before, but rejoins IBM in the fall of 1960. Famous as the chief architect of the IBM System/360, he became an IEEE Fellow in 1965. He founded Amdahl Corp in 1970, where I worked for 7 years; he and I belonged to the same church, in Saratoga. He and his son founded Trilogy Systems in 1979, to integrate a full computer on a single wafer; cooling and power-delivery turned out to be big problems.

Page 20: Forty signatures have been obtained in support of forming a new local chapter on Circuit Theory (eventually developing into today's Circuits and Systems Society chapter).

Page 20: J.C.R. Licklider, VP at BBN, is a panelist at WJCC. BBN made the IMP (Image Message Processor) behind the first nodes of ARPANET; one at UCLA sent "LO" to the one at SRI (before crashing) – the first internet message. It used Vint Cerf's TCP/IP. Robert Taylor, founder of Xerox PARC's computer science laboratory and then DEC's Systems Research Center, both in Palo Alto, credits his own work as extrapolations of Licklider's vision.

Page 24: The New Almaden Museum opens with a ribbon-cutting and an SF Section meeting. Doug Perham and his wife open the event (shown in two photos). Doug explains that he got started collecting electronic artifacts on the advice of George Westinghouse when Doug was just a boy, at the Chicago Worlds Fair in 1893.

Page 52: IRE member William Davidow moves to the SF Bay area. Bill founds Mohr Davidow Ventures in 1983 as one of the early VC firms. I met with Bill and made a "pitch" for a new device my partner and I wanted to produce (based on some IP I licensed from Jack Kilby). However, we didn't get the funding.

Theodore (Ted) Geiszler becomes a new IRE member. He founded a microwave company in Palo Alto, and (in retirement now) is a friend of mine.

IRE ▲ SAN FRANCISCO SECTION

Grid

APRIL ⊖ 1960

WESTERN JOINT COMPUTER CONFERENCE 1960

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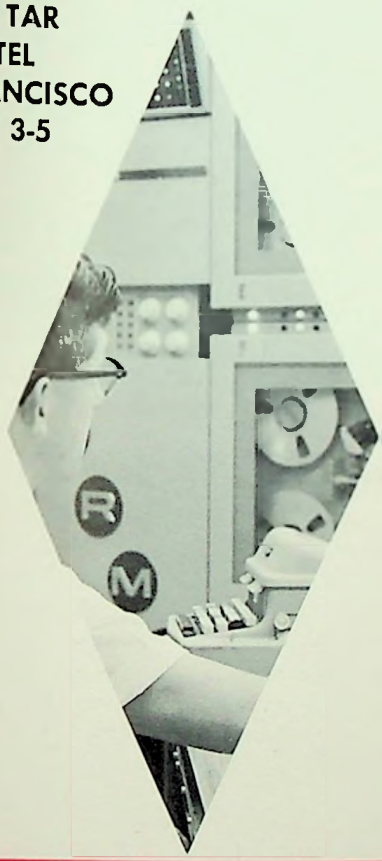

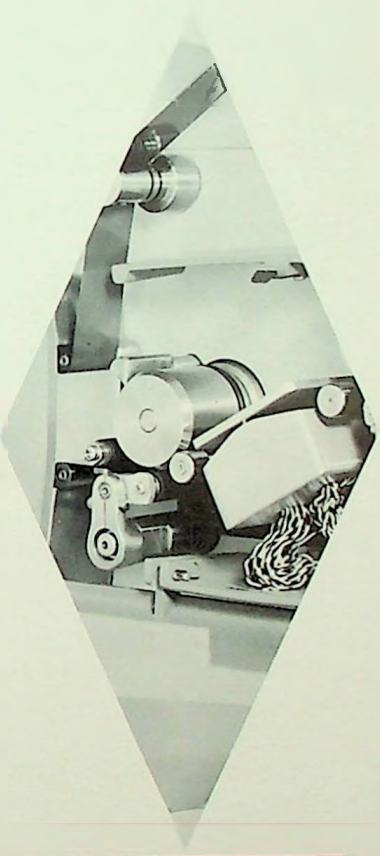

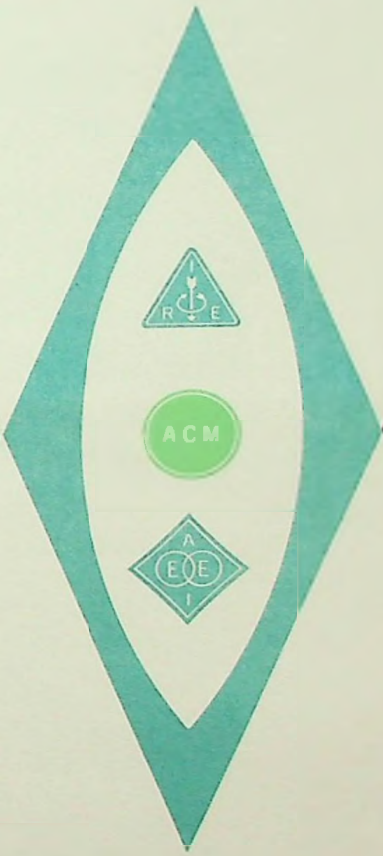

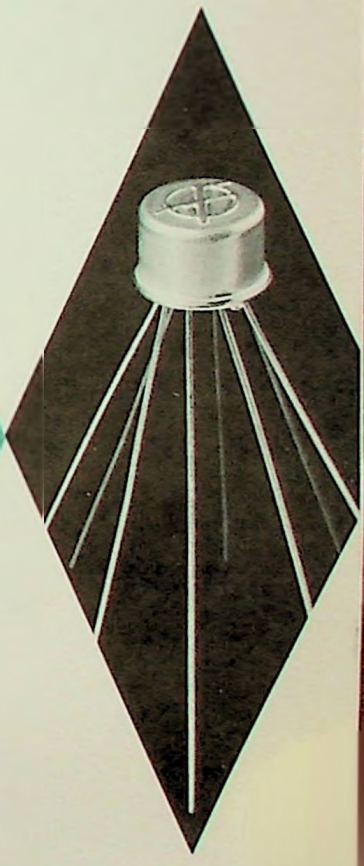

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SAN FRANCISCO SECTION

Grid

VOLUME 6 APRIL 1960 NUMBER 8

(Continued on page 8)

IN THIS ISSUE

ABOUT THE COVER

The Long Peninsula

This issue signalizes two special local events which transpire in the early days of May: At the tip of the Peninsula, the Western Joint Computer Conference co-sponsored by AIEE, ACM, and IRE; at the root, the Second Annual Bay Area Reliability Seminar, sponsored by PGRQC.

For art materials combined into the cover we acknowledge the cooperation and assistance of Ampex Corporation, Fairchild Semiconductor Corp., and Friden Inc. They provided illustrations respectively of the magnetic-tape-handling portions of Erma, an 8-terminal 20-mc flip-flop micrologic element, and a Flexowriter and its strip of 7-channel tape punched with the special message: "Western Joint Computer Conference 1960."

Programs with abstracts and other information for both events are in this issue. See Contents, above.

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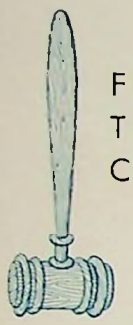


FROM THE CHAIRS

Sophisticated Launching

Doug Engelbart

This evening our cat had two, three, four kittens. Mother cat was matter-of-factly delivering, cleaning, and purring, while the new kittens started right in breathing as if they had always been doing it, and they would start so soon to struggle around looking for food.

Do you realize that, as a program requiring the successful coordination of a huge number of interdependent and sophisticated subprograms, this launching makes that of our trickiest satellite seem primitive in extreme?

Ten weeks ago there were only some basic design templates, and then the many alternative sets of specifications were made up from the rawest of organic raw materials. About nine weeks ago the design was finalized, and raw molecular constituents were assembled into many sophisticated forms and subsystems, some of which had to begin functioning at pre-planned stages of development. And finally, our highly complex, self-healing, self-directing, self-adaptive mechanisms are produced.

I marvel so much at this—then the family pauses to celebrate two human fifth birthdays, and after I give thanks that human litters of four are so rare, I think of all the times I have also marvelled at the amazing learning and adaptive capabilities of these kids we have around us. The realization sure can hit home sometimes about how much progress we people have to make before we can understand kittens and kids, not to speak of being able to synthesize systems that can match them in complexity, sophistication, and function.

It is interesting to note, though, that the people who are going to be at the forefront of man's push to learn how to develop really sophisticated systems are pretty well represented by those who read the **Grid.** Someday, when we develop a functional system rivalling the all-round complexity of a human, it is almost certain that electronics people are going to be strong among the principal participants. From the sensory devices through the inter-communication, internal-control, information-processing, and decision-making processes, to the motor control or signal-transmission devices—throughout the entire "nervous system" that makes a functional entity out of a mere physical collection of things that other kinds of engineers have made—IRE types of people will have contributed mightily.

It isn't only in the super systems that this participation can be noted. From my limited observation, it seems that essentially every synthetic entity of advanced functional sophistication will depend upon us in a similar fashion; and from my biased viewpoint, it seems that the higher capabilities of the central "nervous system" in each will, in particular, depend upon a select few of us, i.e. the members of PG(TMTB) — (too modest to brag). As chairman of the local Chapter of this self-effacing group, I am forced by popular mandate to overcome natural reticence and discuss this matter further in a clear, unprejudiced manner, just as if other PG's were as important as ours.

It seems possible (really, we know) that the most powerful area of social impact for electronics is going to be that associated with the application of increasingly sophisticated electronic information-handling capabilities. Important trends in capability, stemming not only from improvements in the physical machine, but from significant advances in their utilization techniques as well, provide a central core in the 1960 WJCC technical program, for all to see and assess.

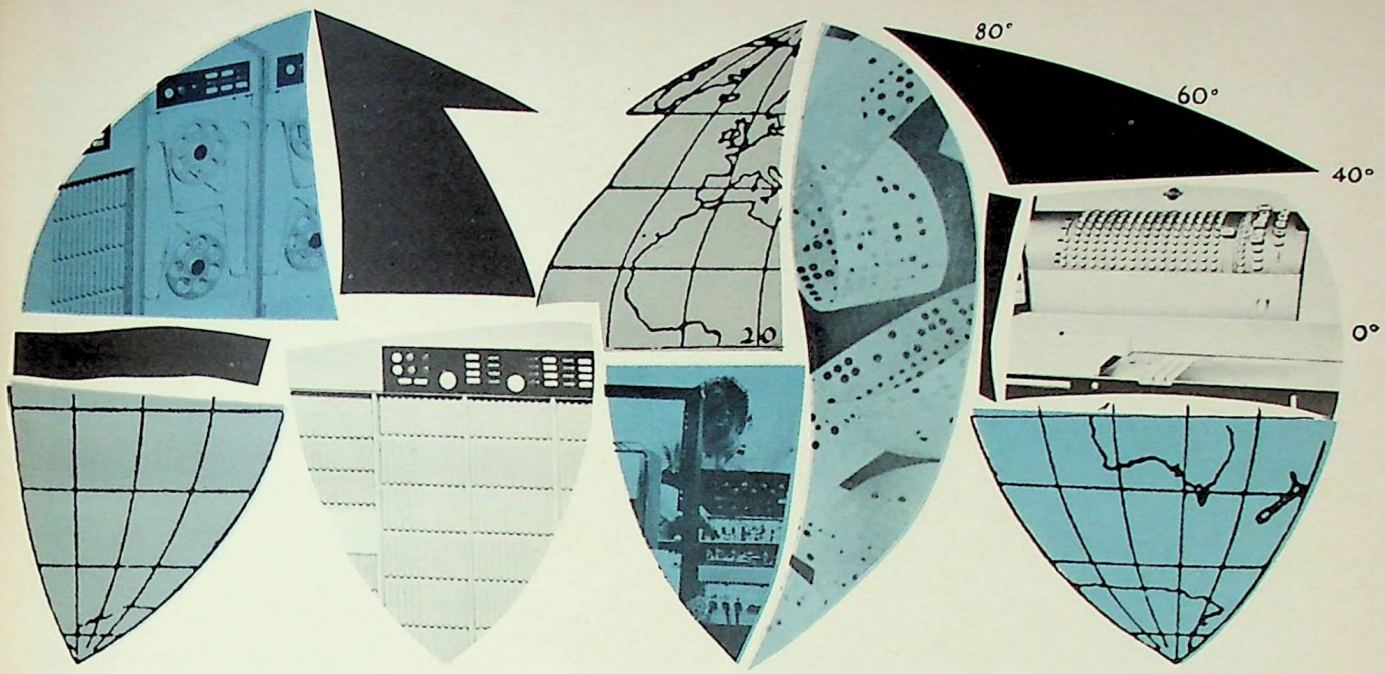
The job of applying even presently available capabilities, judiciously and effectively wherever they can prove their worth in our society, has only just begun. Long before research and new applications associated with utilization techniques begin to saturate (due to bottlenecks in developing new machine capabilities), their effect upon our lives, particularly in the material, procedural, and intellectual aspects, is likely to be something that even the most blue-sky thinker among us is underestimating.

Perhaps you can share our feelings better if you approach this social-impact concept from the following viewpoint. Try assessing the intelligence level needed for accomplishing the easiest 95% of your different daily mental tasks. I'm quite sure that if our machines can't already match that intelligence, they will within a very few years. Now consider the effect on our society when, in the not too distant future, the total capacity of the machines in this country for "mental" work at and below this intelligence level exceeds that total capacity possessed by the human population.

Many other considerations could be thrown in to strengthen your appreciation for the possibilities inherent in future development and utilization of sophisticated man-made systems, but I have to go clean up the caternity ward now.

Doug Engelbart

—Douglas C. Engelbart, chairman, PGEC



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Dexter Hartke, (Photography), Hewlett-Packard Co.

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Hugh Gray (Photography) Hugh Gray Co., San Francisco

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INSTITUTIONS

D. J. Angelakos, Cory Hall, University of California, Berkeley 4

MEETING CALENDAR

SAN FRANCISCO SECTION
8:00 P.M. • Wednesday, April 20, 27

(Tutorial series on radio astronomy—joint with PGAP, see below)

SAN FRANCISCO SECTION
8:00 P.M. • Friday, May 6

(Joint dinner meeting with PGRQC—cocktails, 6:30; wives invited)
"Future System Designs Require Correct View of Man in Relation to Electronics: Is Our View of Man Obsolete?"
Speaker: W. W. Harman, professor of electrical engineering, Stanford
Place: Officers' Mess, U. S. Naval Postgraduate School, Monterey
Reservations: Grace Pacak, IRE office, DAvenport 1-1332. (Menu: page 45, $5 with tax, tip, and cocktails)

EAST BAY SUBSECTION
8:00 P.M. • Tuesday, April 26

(Joint meeting with PGED)
"Ultramicrowave Generation and Amplification with Maser-Like Systems"
Speaker: Dr. J. R. Singer, associate professor of electrical engineering, University of California
Place: Room 227 Cory Hall, University of California
Dinner: 6:30 P.M., Faculty Club—on campus
Reservations: Mrs. Linda Maki, THornwall 5-6000, Ext. 2301; or Evelyn Wenig, DAvenport 3-2441, Ext. 260

PROFESSIONAL GROUPS

Antennas & Propagation
8:00 P.M. • Wednesday, April 20

(Joint with San Francisco Section, tutorial series on radio astronomy)
Lecture No. 3
"Identification and Physical Nature of Radio Stars"
Speaker: Professor John Bolton, radio astronomy department, Caltech
Place: Physics Lecture Hall, Stanford University
Dinner: "Meet-the-speaker," 6:30 P.M., Happy Hour 6:00 to 6:30 P.M., Hal's Restaurant, 4085 El Camino Way, Palo Alto
Reservations: Miss Meyring, DAvenport 1-3300, Ext. 365

Antennas & Propagation
8:00 P.M. • Wednesday, April 27

Lecture No. 4
"Radar Astronomy"
Speaker: Professor A. M. Peterson, electrical engineering department, Stanford University; manager, communication and propagation lab, Stanford Research Institute
Place: Physics Lecture Hall, Stanford University
Dinner: "Meet-the-speaker," 6:30 P.M.; Happy Hour, 6:00 P.M.; Hal's Restaurant, 4085 El Camino Way, Palo Alto
Reservations: Miss Meyring, DAvenport 1-3300, Ext. 365, by noon Apr. 27

Antennas & Propagation
8:00 P.M. • Wednesday, May 11

(Last meeting of season)
"Slot Antenna with Variable Coupling and Application to Linear Array"
Speaker: Raymond Tang, Hughes Aircraft Co., Fullerton, Calif.
Place: Physics Lecture Hall, Stanford University
Dinner: 6:30 P.M.; Happy Hour, 6:00 P.M.; Hal's Restaurant, 4085 El Camino Way, Palo Alto
Reservations: Miss Meyring, DAvenport 1-3300, Ext. 365, by noon May 11

Audio
8:00 P.M. • Monday, April 25

"Electrostatic Monitor Earphones"
Speaker: Walter Selsted, vice president, research division, Ampex Corp.
Place: Hoover School Auditorium, Stambaugh and Charter, Redwood City
Dinner: 6:30 P.M., Social Hour 6 P.M., Algiers, 2620 ECR, Redwood City
Reservations: Inez Vasquez, EMerson 9-7111, Ext. 203, by April 25 P.M.

Communications Systems
8:00 P.M. • Tuesday, April 26

"A Discussion of Non-Great-Circle High-Frequency Propagation and Its Implication to Communication Systems"
Speaker: Russell T. Wolfram, research engineer, communication and propagation laboratory, Stanford Research Institute, Menlo Park
Place: Room 126, Electronics Research Laboratory, Stanford University

MEETING CALENDAR

Dinner: Informal "Meet-the-speaker," 6:00 P.M., Hal's Restaurant, 4085 El Camino Way, Palo Alto
Reservations: Sue Gubrud, DAvenport 6-6200, Ext. 2437

Electron Devices — **8:00 P.M. • Tuesday, April 26**

(Joint meeting with East Bay Subsection—see above)

Electronic Computers — **7:30 P.M. • Tuesday, April 26**

"Parametric Phase-Locked-Oscillator and Esaki-Diode Switching Elements"
Speaker: Dr. Arthur W. Lo, IBM, Poughkeepsie, N. Y.
Place: Auditorium, Bldg. 202, Lockheed Missiles & Space Division, 3251 Hanover Street, Palo Alto

Engineering Writing & Speech — **• Tuesday, May 17**

Details to be announced

Microwave Theory & Techniques — **8:00 P.M. • Tuesday, April 19**

"Significance of the Maser in a Comparison of Classical and Quantum Electromagnetic Theory"
Speaker: Prof. E. T. Jaynes, microwave laboratory, Stanford University
Place: Physics Lecture Hall, Room 100, Stanford University
Dinner: 6:00 P.M., Hal's Restaurant, 4085 El Camino Way, Palo Alto
Reservations: Eleanor Rathbun, DAvenport 6-4000, Ext. 2401

Production Techniques — **8:00 P.M. • Tuesday, May 31**

Plant tour of Hewlett-Packard facilities in Stanford Industrial Park, including new administration building and underground warehouse
Speaker: Noel Porter, vice president, Hewlett-Packard Co.
Place: On Page Mill Road, Palo Alto, go to crest of hill and turn left into parking lot. Proceed to back of the building closest to road

Reliability & Quality Control — **7:30 P.M. • Tuesday, April 19**

"Transistor Reliability" followed by tour of reliability evaluation division, Fairchild Semiconductor Corporation
Speaker: Julian Hilman, manager, reliability evaluation div., Fairchild
Place: Fairchild Semiconductor Corporation, 1060 Linda Vista Avenue, Mountain View. (Directions: From Stierlin Road, between Bayshore and Alma, go east on Terra Bella Avenue one block to Linda Vista Avenue, then proceed north to No. 1060)
Dinner: 6:00 P.M., Hal's Restaurant, 4085 El Camino Way, Palo Alto
Reservations: Julian Hilman, YOrkshire 8-8161

Reliability & Quality Control — **• May 6-7**

Second Annual Bay Area Reliability Seminar
General Theme: "Principles of Reliability"—(see page 14)

Space Electronics & Telemetry — **8:00 P.M. • Tuesday, April 19**

"S-S F-M, A Frequency-Division Telemetry System"
Speaker: Lawrence Wilson, senior engineer, Lenkurt Electric, San Carlos
Place: Auditorium, Bldg. 202, Lockheed Missiles & Space Division, 3251 Hanover Street, Palo Alto
Dinner: "Meet-the-speaker" dinner, 6:30 P.M., Hal's Restaurant, 4085 El Camino Way, Palo Alto
Reservations: Lois Reed, REgent 9-4321, Ext. 28150, by 12 noon, April 19

CHRONOLOGICAL RECAP

April 19—Microwave Theory & Techniques, Reliability and Quality Control, Space Electronics & Telemetry
April 20—San Francisco Section/Antennas & Propagation
April 25—Audio
April 26—East Bay Subsection/Electron Devices, Communications Systems, Electronic Computers
April 27—San Francisco Section/Antennas & Propagation
May 6-7—San Francisco Section/Reliability & Quality Control
May 11—Antennas & Propagation
May 17—Engineering Writing & Speech
May 31—Production Techniques

Dunn

Kaisel

THE SECTION

Nominations Are Open

That time is here again when the far-sighted constitution of the Institute provides that we shall determine the composition of our roster of officers for the season beginning in September. Two kinds of nominees may appear on the ballot in the **Grid** next month: Those you may wish to provide, and those presented by the nominating committee.

This latter body, with Earl Goddard as chairman, has diligently explored

Lacy

Susskind

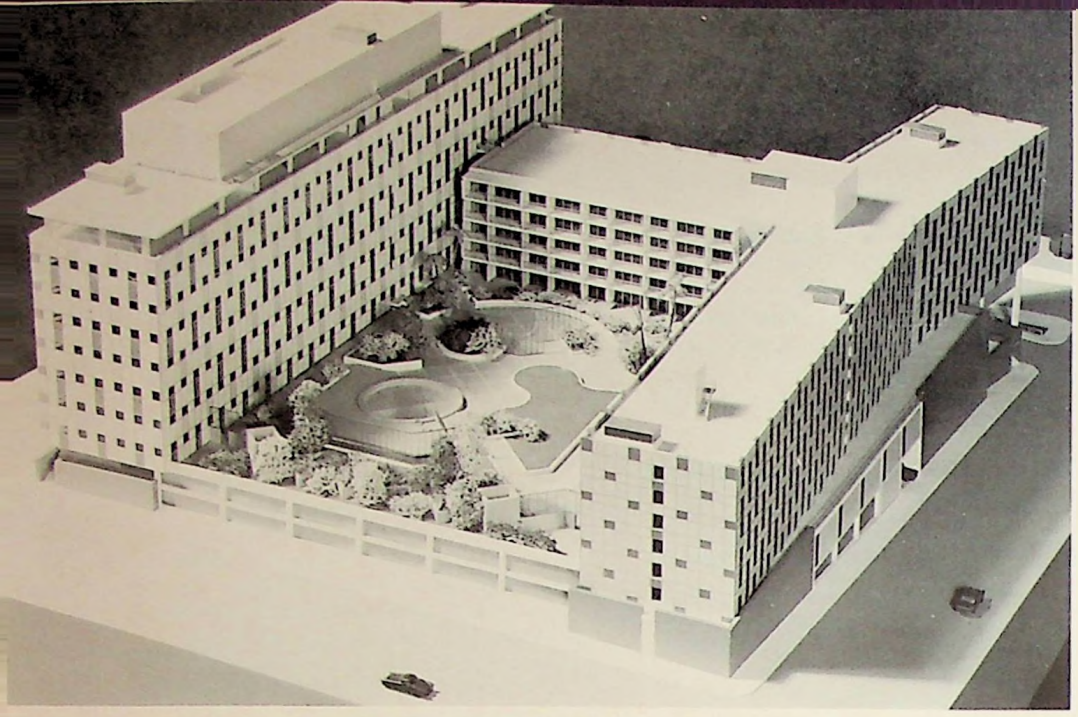
the matter and proposes the following: Dr. Donald A. Dunn for chairman, Dr. Stanley F. Kaisel for vice chairman, Dr. Peter D. Lacy for secretary, a choice between Dr. Charles Susskind and W. Bruce Wholey for treasurer, and Albert J. Morris for Section director.

Should it be your wish to add to this distinguished slate, first be sure your man can and will serve if elected. Then, generate a petition signed by no less than ten qualified voting members of the Section. Submit this to the present secretary, Stan Kaisel.

And watch for the ballot in the May issue!

Wholey

Morris



At press time, only the scale model of the Jack Tar Hotel was complete enough for this view

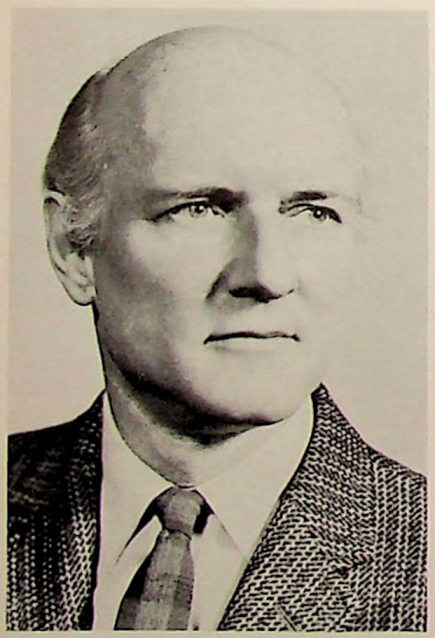
WJCC—1960

Decade of Challenge

As a general theme, the 1960 Western Joint Computer Conference has adopted "Challenge of the Next Decade." In his message of welcome to attendees, Chairman Bennett states that the objective of the affair is to raise questions about what is being done, why it is being done, and what direction should be taken.

"The Conference," says Bennett, "does not propose to answer all of these questions. Rather, the aim is to stimulate people in controversial subject areas and to arouse a self-critical evaluation of the future of this dynamic industry. If this occurs, the Conference will have been a success."

Thirty-eight papers are to be presented in twelve sessions, each session featuring a group of panelists—a format similar to that used so successively at WESCON last year. One session which appears to offer a particularly broad theme covers the design, programming, and sociological implications of microelectronics. In scope, it will range from a consideration of the components themselves to the construction of a computer utilizing them, and from the programming of this machine as an "intelligent technician" to the question of "Who could use it and how," all in four separate papers.



Heinz Von Foerster

Special Events

A cocktail party will be held on Tuesday in the patio of the Jack Tar.

A conference banquet will be held Wednesday in the ballroom. The speaker will be Professor Heinz Von Foerster of the department of electrical engineering, University of Illinois, Urbana. His subject will be "Living Computers."

Von Foerster was born in Vienna and holds a physics engineering diploma from the Institute of Technology of that city as well as a PhD in physics from the University of Breslau, Germany. He has been a physicist with Leyhold's Nfg, Colon, Germany; and with Siemens Research Laboratory, Berlin. He has been director of the gaseous discharge and microwave research laboratory GEMA, Berlin, and Liegnitz, Germany; and director of the research laboratory

(Continued on page 12)

WJCC—1960

Program

SESSION IA

Tuesday, May 3
9:30 A.M. to 12:30 P.M.

Welcoming remarks by
ROBERT M. BENNETT, Chairman
Western Joint Computer Conference Committee

COMPUTER ORGANIZATION TRENDS

Chairman: Arthur J. Critchlow
IBM Corporation

Panelists:
Gene Amdahl, Aeronutronic Corporation
Morton M. Astrahan, IBM Corporation
J. Wesley Leas, RCA

Revolutionary changes brought about by computers can be expected in the new decade. This session will attempt to answer the question, "Which way are computers evolting?" and thus aid in pointing out how computers may affect our civilization in this decade.

Computer organization may be categorized into three types:

1. *Classical stored program organization as developed by J. Von Neumann and others. These computers handle instructions in serial fashion and have one instruction counter. They will be discussed in a short historical review of computer development.*
2. *Improved machines which provide sophisticated logical structure to improve performance. Typical techniques are asynchronous operation, overlap of instruction and execution and high speed memory.*
3. *Multiplex information processes, which carry out several operations simultaneously, may have several separate memories and are made up of modular units which can be joined in a flexible way.*

Computer developments exemplifying the trends toward more complex logical structure will be described.

"THE HISTORICAL DEVELOPMENT AND PREDICTED STATE-OF-THE-ART OF THE GENERAL PURPOSE DIGITAL COMPUTER"

C. P. Bourne and D. Ford, Stanford Research Institute

Some of the important characteristics of all the general-purpose digital computers that have been built, or are being built, have been collected to show the changes in performance and characteristics. Those collected data, as well as information regarding recent development work, have been used to extrapolate the characteristics and performance figures into the 1960-1965 era. The report considers such characteristics as add and multiply times, memory characteristics, pulse repetition rates, and internal system parameters.

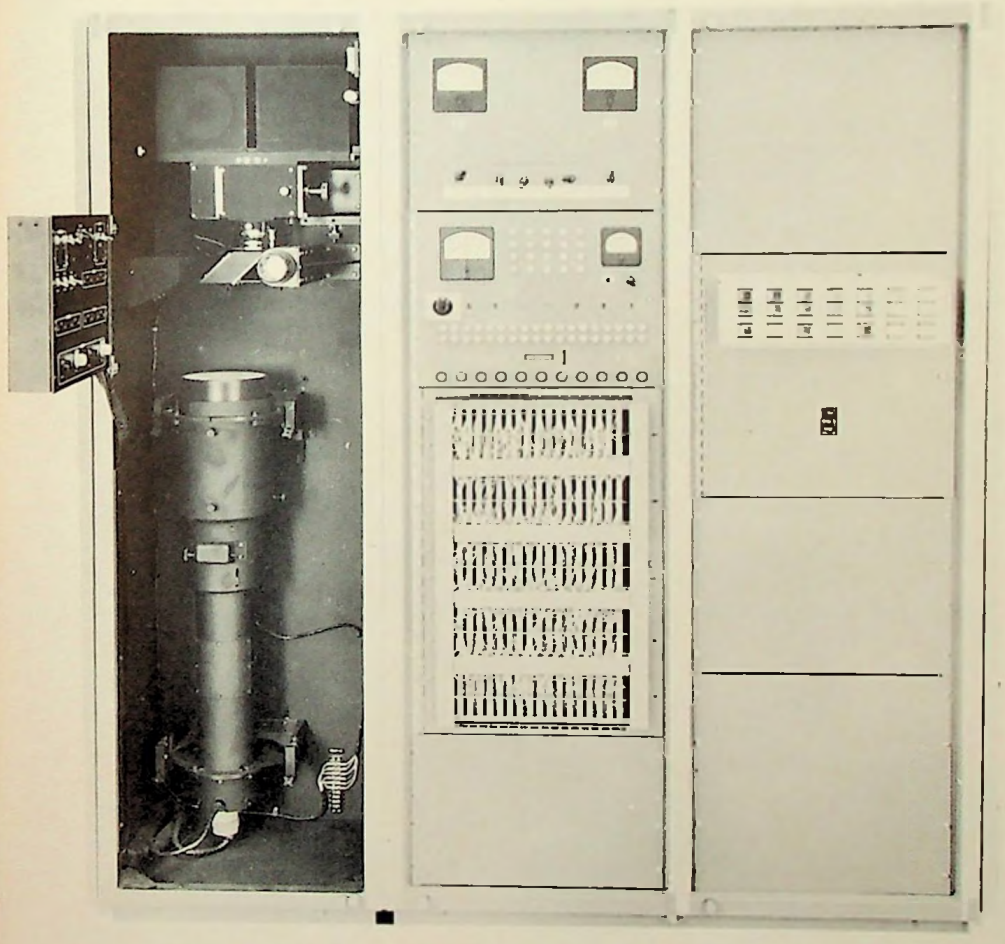
The data seem to suggest that the majority of the computers developed between now and 1965 will show very little change in performance from that obtained during the last five years. However, a few research machines will definitely advance the technology, possibly as much as one order of magnitude for some of the characteristics. An appendix includes a listing of approximately 300 different computers, in an attempt to provide an initial directory of the world's computers.

"THE HARVEST SYSTEM"
P. S. Herwitz and J. H. Pomerene, IBM

The Harvest System is a large scale data processor designed for maximum performance in han-

(Continued on page 12)

See the new 15,000 point/second microfilm printer at W. J. C. C.



First showing of the new Stromberg-Carlson-San Diego S-C 4000 microfilm printer will be at the Western Joint Computer Conference. See it at Booths 110 and 111 at the Jack Tar Hotel in San Francisco, May 3, 4 and 5.

Fifteen thousand plotting points or alphanumeric characters per second can be recorded on microfilm by this unique high-speed printer. Compatible with most major computers for on-line or off-line operation. It is ideal for all kinds of computer printing, filing and archive storage. In a typical graph plotting application requiring each month an average of 2000 graphs with 375 points each, one S-C 4000 can do the work of twenty-five engineering aids at considerable savings.

See the S-C 4000 at W.J.C.C. or write for more detailed information. Stromberg-Carlson-San Diego, Dept. A-47, 1895 Hancock Street, San Diego 12, California.

STROMBERG-CARLSON-SAN DIEGO
A DIVISION OF **GENERAL DYNAMICS CORPORATION**

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George A. Bernard, vice chairman

Howard M. Zeidler, chairman, technical program

Jack E. Sherman, vice chairman, technical program

MORE WJCC

of E. Schrack A. G., Vienna. He has been on the University of Illinois faculty since 1949.

In 1956 and 1957 he was a Guggenheim Fellow. He serves as a consultant to the U. S. Department of Health, Education and Welfare; Brookhaven National Laboratory; National Cash Register Corporation; and the Nelson Fund Inc. He holds memberships in Sigma Xi, the American Association for the Advancement of Science, the Illinois Academy of Science, and the Biophysical Society.

WJCC women's activities will include a talk by Miss Phyllis Baxendale of IBM on "Conversations with Computers"; a chartered bus trip to Sausalito for luncheon and a fashion show at the Alta Mira Hotel; and an open day for sightseeing or shopping.

Registration and Proceedings

No advance registration is provided for at WJCC. Registration will be taken in the lobby of the Jack Tar Hotel as follows: May 2, 6:00-9:00 P.M.; May 3, 8:00 A.M. to 4:00 P.M.; May 4, 8:30 A.M. to 4:00 P.M.; and May 5, 8:30 A.M. to 1:00 P.M. Sponsoring-society fees will be $6.00; non-member $7.00; and student $3.00. All but students receive a copy of the proceedings. Extra copies are $3.00.

Harry K. Farrar chairman of exhibits

Joseph P. Fernandez secretary

Miss Mary Fraser, chairman of women's activities

MORE WJCC PROGRAM

dling extremely large amounts of data in primarily non-arithmetic operations. It is being built by IBM under contract with the government and incorporates both a new system organization and a stored program concept of macro-instructions, which directly implement many useful data manipulating subroutines. Design features include a very high processing rate and an on-line table lookup facility for effecting very general transformations.

"ORGANIZATION OF COMPUTER SYSTEMS—THE FIXED PLUS VARIABLE STRUCTURE COMPUTER"

Gerald Estrin, University of California, Los Angeles

A computer organization is described which facilitates the execution of special purpose designs for applications which warrant the effort.

A "fixed" structure general purpose computer is made to cooperate with an inventory of substructures of varying complexity. Within the constraint of the total inventory, it is possible to design simultaneously operating subsystems for any problem by specifying substructures and interconnections.

The process leading to initial specification of the system, its modes of operation and the manner in which the system will grow are discussed.

"HORIZONS IN COMPUTER SYSTEMS DESIGN"

Walter F. Bauer, Ramo-Wooldridge Corp.

One of the most rapidly increasing computer applications, and one that will probably dwarf all others, is the so-called "information systems." This applications area emphasizes automatic data input and man-machine communication, and to a greater extent, extends man's intellect through electronics. Systems of this type place greater emphasis on the need for computers which can be adapted to problems, a quality absent in most system designs.

To meet the needs for computer system design, the future will undoubtedly bring a greater emphasis in the following items: concurrent operation of large system components, control hierarchies which give a self-organizing character, elaborate intra-system communication, user-oriented instruction repertoires, remote-user operation, facilities and techniques for data interrogation and display, reaction to stimuli external to the computer, modular design, micro-second flexibility, and growth capability. Some of the newer computers having these qualities in varying degrees are the PILOT, GAMMA 60, and the RW-400.

Notable recent accomplishments in the information handling field are the development of ultra-high speed circuitry, problem-oriented computer languages, efficient translators, and automated "local design" or circuit design. Advances in computer system design, or "global design," are badly lacking, however. Some techniques are beginning to emerge which involve the identification of information systems characteristics and the matching of the characteristics to hardware implementation. Queueing theory and simulation by computer are examples of the possible tools.

SESSION IIA

Tuesday, May 3
2:30 to 5:30 P.M.

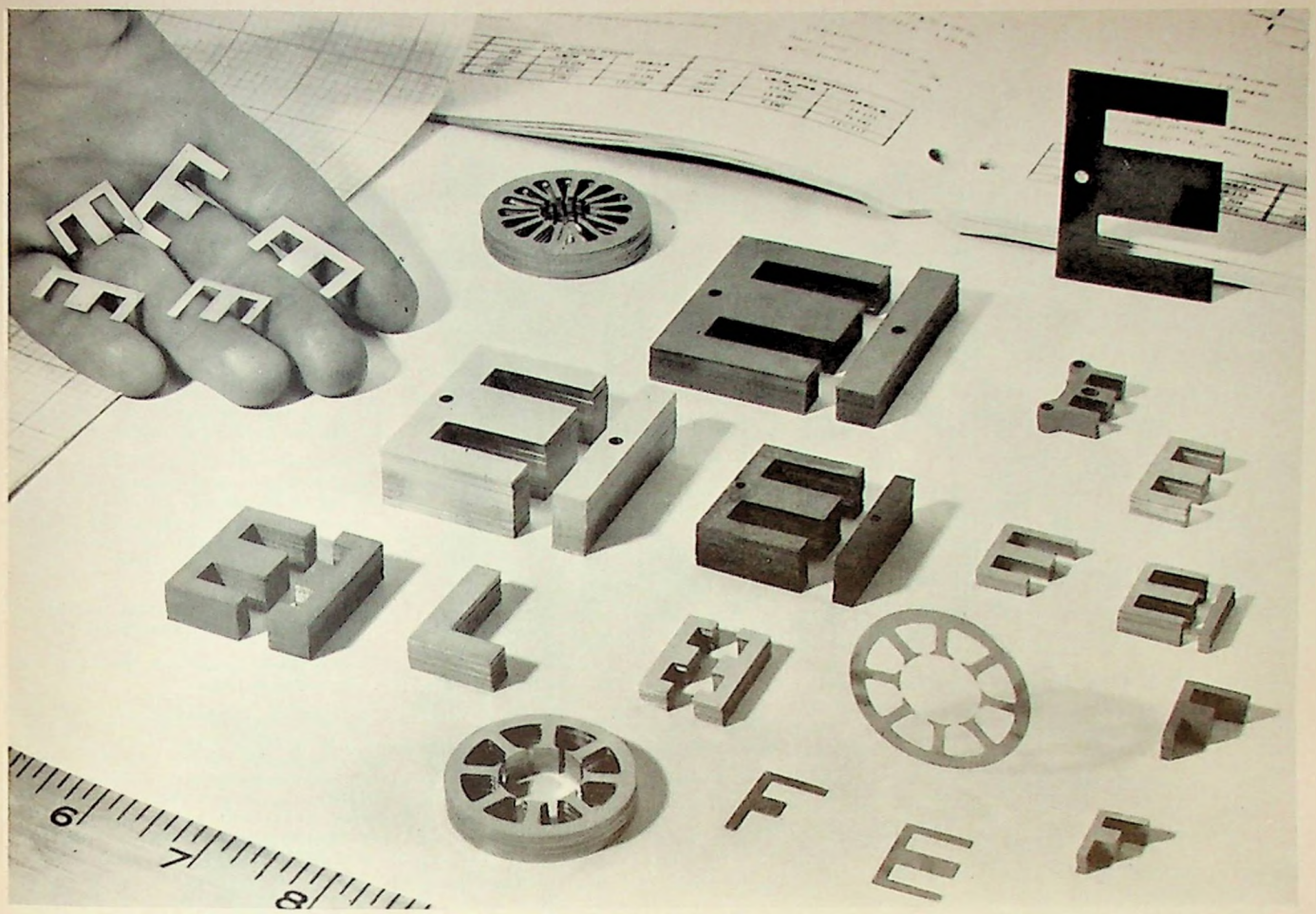
DATA RETRIEVAL

Chairman: Robert M. Hayes
Electrada Corporation

Panelists:
John Postley, Rand Corporation
Mrs. P. B. Bremer, FMA, Incorporated
M. E. Maron, Rand Corporation

Technical advances in the computer field and the increasing understanding of the usage of these devices combine to make feasible the solution of hitherto unapproach-

(Continued on page 14)



How to be sure of *TOP QUALITY* Nickel-Iron Laminations for high performance motor and transformer applications

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This 54 page booklet contains complete specifications and detailed drawings of all standard Repath nickel-iron and silicon-steel laminations. Also illustrates line of stamped metal components for electronics.

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The easiest way to get top value is to specify Repath laminations. *Why?* Because their manufacture is *quality controlled* from start to finish.

Take annealing for example. This operation is most important because it develops the ultimate permeability of the lamination. Repath laminations are hydrogen annealed in modern globar heated Inconel retort furnaces.

Very dry hydrogen (−40° F dew-point and lower) is used to insure clean lamination surfaces, and to remove impurities from the steel for better performance and higher magnetic properties. Electronic cam-type program controllers control the entire annealing cycle. Following annealing, all Repath laminations are tested for permeability and core loss by permeameters in the laboratory prior to packaging and shipping.

This emphasis upon modern, well-maintained equipment, plus the experience, care and skill which is applied to each customer's requirements, is your assurance of uniformity and dependability in finished laminations.

Specify Repath's nickel-iron laminations for high frequency applications where high permeability and very low core loss are required. They're available in a wide range of standard shapes and sizes. Also available: a complete line of silicon steel laminations.

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THE ARNOLD ENGINEERING COMPANY, Main Office: MARENGO, ILL.
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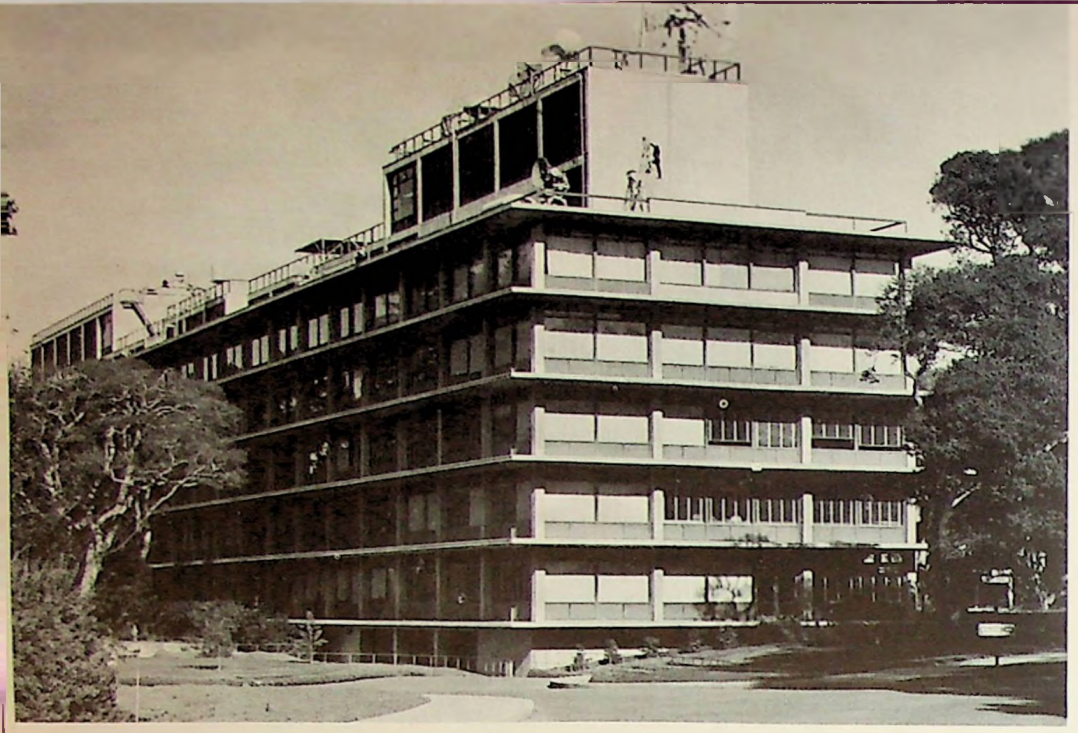


Spanagel Hall, main engineering building at the U. S. Naval Postgraduate School

RELIABILITY SEMINAR

Policy Matters

With cooperation from ASQC, the San Francisco Chapter of PGRQC will present the Second Annual Bay Area Reliability Seminar on May 6-7 at the U. S. Naval Postgraduate School, Monterey. During the day on Friday, morning and afternoon sessions of seven papers will be presented.

That evening there will be a joint dinner meeting between the San Francisco Section and the PGRQC Chapter, with Professor W. W. Harman, Stanford University, as speaker.

Saturday morning will be occupied by a series of formal debates so arranged as to permit a disciplined form of audience participation. Throughout the session the attempt will be to direct attention to reliability policies rather than procedures.

Preregistration for the seminar can be accomplished by application to Julian Hilman at Fairchild Semiconductor Corporation, 844 Charleston Road, Palo Alto. Advance-registration fees are $9.00, whereas door registration will be $12.00. Housing information can also be obtained from Hilman.

Complete program information on the Reliability Seminar can be found in this issue, following the WJCC program. Please turn to page 43.

The old custom house, a State historical monument in Monterey, and the oldest government building in California

MORE WJCC PROGRAM

able data processing problems. The principal one is "data retrieval." The problems are of immediate interest because of their importance and because the tools of their solution seem to be at hand.

Data retrieval, combining as it does problems in both logical manipulation of information and physical handling of storage media, brings the computer field directly into an area which has previously been considered peripheral. Large capacity data storage equipment can no longer be treated as external to the computing system; it is no longer merely an input-output medium; it can no longer be limited to the role of providing data to the "main frame." The organization and handling of large files of information must be considered as integral to the data processing and manipulation.

The papers in the session on Data Retrieval represent the growth in the computer field of understanding of these problems. They are directly concerned with this new area of relationship between logical requirements and physical limitations.

"A MULTI-LEVEL FILE STRUCTURE FOR INFORMATION PROCESSING"

Louis Miller, Jack Minker, W. G. Reed, and W. E. Shindle, RCA

This paper presents a multi-level file structure for a man-machine system which has the function of processing natural language or textual data. The system inputs are varied and can be structured into several levels of formalization each of which permits a different degree of interpretation and processing. Moreover the inputs are fragmentary and require synthesis into more meaningful associations. They also are questionable with regard to their reliability, thus requiring verification processing.

The file structure which has been developed facilitates the storage, retrieval, and processing of data with these characteristics. It accommodates a variety of information in different stages of development and authenticity. The file vocabulary consists of sets of indices which retain the syntactical relations of inputs. A description is given of the list-type organization of these files and of an algorithm by which the computer logically associates various input elements which have been stored within the files.

"SYMBOLIC LOGIC IN LANGUAGE ENGINEERING"

H. M. Semarne, Douglas Aircraft Company

Decision-methods applied to documentation research, information retrieval, and machine translation are introduced and developed. These applications are based on a Symbolic Logic Truth-Matrix computer technique discussed in an earlier paper, presented at MIT, September 1959.

The decision-methods of the present paper include a "characteristic pattern analyzer" which is a condensed symbolic record of the information to be stored or retrieved. This analyzer is the result of the solution of a system of logic statements.

Further, an automatic treatment of the typical "sufficient clues" problem of multiple-input document searching is given.

A probabilistic logic method of information retrieval is discussed with respect to the decision-methods developed.

The paper concludes with a description of the utilization of the symbolic logic technique in machine translation, particularly in metalanguages, the rational intermediaries between natural languages, and in morphological analysis, the study of word order and inflection.

(Continued on page 16)

LIBRASCOPE LISTS KEY ENGINEERING POSITIONS AVAILABLE

DESIGN ANALYST – Analysis of systems and subsystems recommending specific improvements to design engineers. Requires BSEE with 2 years' direct experience.

ELECTRONIC ENGINEERS – Advanced development and new concepts in memory systems. ■ BSEE with 3-5 years' experience doing original work in field.

■ Advanced development in digital display techniques. ■ BSEE or advanced with 3-5 years' experience in electro-luminescent doing original work.

■ Study and development of components to be applied in future components. ■ BS in EE or Physics or advanced degree with 5-10 years' experience in circuit and components.

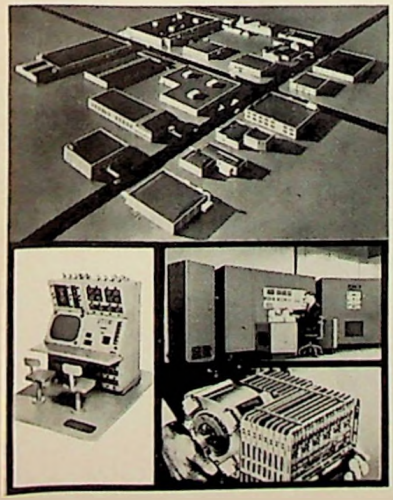
MECHANICAL ENGINEERS – Development of prototype inertial sensors using novel approaches. Requires BSME or advanced degree with 5-10 years' experience in design of high precision inertial equipment. Capable of evaluating existing sensors in terms of their application to control systems.

■ Design and develop mechanical analog computing devices for use in naval fire control systems. ■ BSME with 5 years' experience in field, including packaging of gear trains, modules, etc.

CIRCUIT DESIGN – Design of circuits and subsystems for integrating digital computers with airborne and missile guidance system equipment. ■ BSEE with 2 years' experience in pulse circuit design and a thorough knowledge of digital computers.

GLEN SELTZER ARRIVES IN SAN FRANCISCO

Glen Seltzer, Employment Manager of Librascope Division, General Precision, Inc., arrived today to interview engineers for a variety of openings currently available at the California electronics facility. Shown at right are photographs of 3 computers currently being manufactured by Librascope. Also shown is a composite view of Librascope's 29 buildings located in Glendale, Burbank, and Sunnyvale, California. Seltzer stated that no recruiting will be done at Librascope's exhibit, but engineers interested in relocating, may arrange an appointment at his hotel suite by calling PRospect 6-3366.



.....unless you are interested in moving into a climate for ingenuity...LIBRASCOPE/California...one of America's oldest and largest computer manufacturers...

.....unless you are looking for a decentralized atmosphere with the utmost latitude for individual achievement. (Just the reason Librascope locates its engineers in 29 separate buildings in Glendale, Burbank, and Sunnyvale...operates a variety of autonomous engineering units with complete control over projects from design to prototype.)...

.....unless you are an Electronic or Mechanical Engineer, Physicist or Mathematician with computer experience, and want the facts on a fast growing leader in the fast growing field of computer technology...

please don't call Glen Seltzer

If you are interested, be the first to dial **PRospect 6-3366.** **Glen Seltzer** *or* **Fred McMullin** *will be glad to arrange an informal "fact session" at your convenience.*

WESTERN JOINT COMPUTER CONFERENCE

See Librascope's exhibit...space 106

Computers that pace man's expanding mind

LIBRASCOPE DIVISION GENERAL PRECISION, INC.

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LI 012A

Walt Selsted, Ampex research vice president, and speaker at the April PGA meeting, right, discusses the new electrostatic headphones, the topic of the meeting, with Reno Chen, assistant engineer, Ampex

MEETING AHEAD

Hi-Fi Fones

At the April 25 meeting of the Professional Group on Audio, Walter Selsted, vice president of the research division at Ampex, will describe and demonstrate electrostatic headphones. This newly developed product has a number of interesting features including a frequency response comparable to that of high-quality microphones. See Meeting Calendar on page 8 for further particulars.

MEETING AHEAD

Painting the Ground

A newly developed slot antenna with variable coupling will be described at the May 11 meeting of PGAP. Consult the Calendar on page 8 for more details about the meeting itself.

The importance of a waveguide linear array capable of producing many different radiation patterns has led to the development of a slot radiator with variable coupling. An array of such radiators can be used as a laboratory apparatus for the evaluation of aperture distributions, or as a ground-painting reconnaissance antenna operable at many different altitudes.

The slot radiator consists of a longitudinal slot centered in the broad face of a rectangular waveguide. An adjustable iris excites the slot by introducing controlled asymmetry in the waveguide fields. The theory of operation and the characteristics of this variable-coupling slot are presented These characteristics are shown in curves usable for design purposes.

A detailed discussion is given of the technique used in determining the range of conductances of this slot. The control of coupling available is demonstrated by measured radiation patterns on a 12-element array in which the conductance values are varied to obtain side-lobe ratios from 10 db to 34 db. The method used in obtaining the aperture distribution for these radiation patterns is also presented.

Raymond Tang, the speaker, received his BSEE degree from the Polytechnic Institute of Brooklyn in 1955, and his MSEE degree from the University of Southern California, Los Angeles, 1958.

From 1955 to 1959, Tang worked at the antenna department of the microwave laboratory of Hughes Aircraft Company, Culver City. He transferred to the microwave department of the radar laboratory of Hughes Aircraft Company, Fullerton, in 1959.

MEETING AHEAD

Comparing Theories

Classical and quantum electromagnetic theories will be discussed by Professor E. T. Jaynes at the April 19 meeting of PGMTT. See page 9, Meeting Calendar, for particulars.

The recently noticed mathematical relation between the theories of the maser and of classical parametric amp-

(Continued on page 18)

MORE WJCC PROGRAM

"THE FACT COMPILER — A SYSTEM FOR THE EXTRACTION, STORAGE, AND RETRIEVAL OF INFORMATION"

Charles Kellogg, Ramo-Wooldridge Corp.

The Fact Compiler is a system for the timely extraction of significant information from source data and for the storage of this information in an organized manner that permits rapid retrieval. In addition, the Fact Compiler can process or manipulate the stored data in a variety of ways, and it is adaptable for use with present reporting techniques. The system is capable of orderly growth to meet changing requirements of growing organizations.

Information is stored according to a logico-linguistic structure. This structure enables the system to (1) directly interrogate personnel and request the reporting of specific information, (2) automatically present desired data at the appropriate time intervals, and (3) retrieve information according to subject, aspect, date, degree of specificity, and organizational unit.

SESSION IIB

Tuesday, May 3
2:30 to 5:30 P.M.

COMPONENTS AND TECHNIQUES

Chairman: Robert C. Minnick
Stanford Research Institute

Panelists:
D. A. Meier, National Cash Register
Norman L. Kreuder, Electradata

New computer component development continues at a rapid pace. In recent years there has been phenomenal progress in solid-state devices. This session will deal with magnetic components. The first paper deals with a non-destructive multiapertured core memory; the second with a permanent translating device which relies on magnetically-coupled wires; and the third with characteristics of a multiple-layer vacuum-deposited magnetic memory.

"A WORD-ORIENTED TRANSISTOR-DRIVEN NON-DESTRUCTIVE READ-OUT MEMORY"

D. G. Fischer and T. C. Penn, Texas Instruments, Inc.

Using three-aperture ferrite memory cells, a 512-word non-destructive read-out memory has been operated with transistor drivers. Writing and reading are achieved with bipolar two-pulse sequences, which are respectively, ERASE, WRITE and SET, READ. Due to the inherently non-destructive manner in which the cells are operated, no regeneration cycle is necessary to restore information to interrogated cells. The necessary bipolar writing and reading pulse sequences are conveniently provided by a novel magnetic switch matrix, in which all rows and columns are driven in coincidence except those intersecting at the desired address. The resultant driving current at the desired address is the sum of all the transistor driver currents, or 2(N-1) times the individual transistor driver currents for an N^2 matrix.

"UNIFLUXOR: A PERMANENT MEMORY ELEMENT"

A. M. Renard, Aeronutronic
W. J. Neumann, Remington Rand Univac

The Unifluxor is a new binary permanent memory element which appears to have the advantages of high-speed operation, easy fabrication, and low cost. Unlike cores, twistors, capacitors, and other commonly used memory devices, the Unifluxor does not depend upon the hysteretic properties of some non-linear material but instead uses the inductive characteristics of magnetically coupled wires.

(Continued on page 18)

NEW, UNIQUE RCA 5-KW FM TRANSMITTER UTILIZES 4CX5000A CERAMIC TETRODE

RCA has recently developed a unique new 5-KW FM transmitter which utilizes the new technique of multiplexing. This provides simultaneous transmission of two or more program channels on the same RF carrier to meet increased demands of FM stations for additional program services.

The PA stage of the new BTF-5B transmitter is composed of a single Eimac 4CX5000A ceramic tetrode, which produces the 5000-watt output. This tetrode offers high power gain and excellent stability to assure faithful transmission of the broadband multiplex signals.

That's why the 4CX5000A was the logical choice of discriminating RCA engineers. Its many exclusive ceramic design features help to make possible this conservatively rated, high power, air-cooled transmitter.

These ceramic extras are now available in more than forty Eimac tube types—used in many types of communication, pulse and industrial equipment.

EITEL-McCULLOUGH, INC.

San Carlos, California

Eimac

J. R. Singer

MORE THEORIES

lifier systems will be explored. The solutions of classical equations representing maser behavior will be shown to reproduce many of the properties usually associated with field quantitization. This raises the question whether there is any known effect involving microwave frequencies which would require a quantum treatment of the electromagnetic field for its explanation. A conjecture, that what are presently termed "quantum effects" may all be explainable in purely classical terms as a result of parametric behavior, will be discussed.

MEETING AHEAD

Excited Molecules

There will be a three-way joint meeting on ultramicrowave generation and amplification on the last Tuesday in April. Sponsors are the science and electronics division of AIEE, the East Bay Subsection, and the PGED Chapter. See the Meeting Calendar, page 8, for other data.

Professor Singer came to Berkeley in 1957 from the National Scientific Laboratories, Washington, D.C., where he was chief staff physicist. He has also taught at the University of Connecticut, the Catholic University of America, and George Washington University. His principal interests are magnetism, computers, solid-state physics, masers, and optical masers. He is the author of "Masers,' published by Wiley in 1959.

Molecular methods of generating and amplifying submillimeter and shorter waves now appear feasible. Professor Singer proposes to discuss several promising approaches to experimental realizability. A study of levels of sodium, potassium, cesium, and mercury vapor, as well as Al_2O_3 plus Cr_2O_3, indicate

(Continued on page 20)

MORE WJCC PROGRAM

A Unifluxor memory array consists of a printed circuit board upon which are etched longitudinal drive lines and transverse sense lines. Each intersection of a drive and sense line represents one bit, with the bits of one word lying along the same drive line. Thus, the array operates in the word-organized mode.

The particular state of each bit depends upon the presence ("one") or absence ("zero") of a copper slug. The copper slugs, properly spaced and oriented, are contained on a plastic film cemented in place over the printed circuit board. To change the contents of the memory, it is necessary to substitute a new cover film with the desired pattern of copper slugs.

"CHARACTERISTICS OF A MULTIPLE MAGNETIC PLANE THIN FILM MEMORY DEVICE"

K. D. Broadbent, S. Shohara, and G. Wolfe, Jr., Hughes Aircraft Company

A ferromagnetic film memory element having a complex structure of evaporated magnetic, dielectric, and conducting materials is described. The multiple magnetic plane geometry enhances the characteristics which are desirable in practical digital computer memories without requiring extreme uniformity and control of the magnetic properties. The elements are capable of output voltages and selection ratios much higher than normally available from simpler structures, as well as possessing the properties of fast switching speeds and extremely small size.

A brief review of the basic magnetic structure and mode of operation is given. Electrical characteristics of prototype memory elements are described. The results are discussed in terms of application in computer memory systems and directions of future development efforts.

SESSION IIC

Tuesday, May 3
2:30 to 5:30 P.M.

ANALOG EQUIPMENT

Chairman: R. M. Howe
University of Michigan

Panelists:
Vernon L. Larrowe, University of Michigan
Mark E. Connelly, Mass. Institute of Technology

The development of new computer components generally falls into two categories: components which represent improved performance over previous components used for the same computing tasks; and components which allow computations based on entirely new principles. The three papers in this session are in the latter category.

"ANALOG TIME DELAY SYSTEM"

Charles D. Hofmann and Harold L. Pike, Convair Astronautics

The Time Delay System is being developed to generate true time delays and to be used in autocorrelation and cross-correlation problems in conjunction with analog simulation. The system consists of a 14-channel magnetic tape transport, a delay control system, an analog-to-digital converter, ten digital-to-analog converters, and a master timing system. Several unique features include:

1. A variable time delay from 0.01 to 10 seconds in increments of 0.01 seconds with ±.005 second accuracy. This delay is controlled with a digital servo loop.
2. Accuracy of ±0.1% at 100 cycles per second.
3. Ten channels of analog input and output data being delayed simultaneously.
4. An analog-to-digital converter, times shared between all ten channels of data, which digitizes at the rate of 1 bit every 1.1 microseconds.
5. A constant speed 100 inch per second tape transport with variable loop length and packing density of 400 bits per inch.
6. Complete transistorization.

This system is in the assembly stage; design is complete on all components.

"DAFT: A DIGITAL/ANALOG FUNCTION TABLE"

Robert M. Beck and Jack M. Mitchell, Packard Bell Computer Corporation

Design of a digital function generator based on incremental digital computer techniques is described which is capable of generating both mathematical functions and arbitrary functions. The mathematical functions are generated using parallel Digital Differential Analyzer methods. The arbitrary functions are obtained by generating interpolating curves through programmed numerical points. The mathematical functions can be generated with a high degree of accuracy and repeatability, while the arbitrary functions can be generated to a high degree of repeatability but an accuracy limited by second-order interpolation methods.

The interpolating equation generates a curve made up of a chain of parabolic segments passing through 32 numerical points which may be unequally spaced along the X axis. Second order and first order interpolation may be performed.

Fourteen bit incremental Analog-to-Digital and Digital-to-Analog converters are included which enables the use of the DAFT system in conjunction with analog computer facilities. A 3 megacycle clock rate is used, enabling the transfer of information at 100,000 increments per second allowing for very high speed computation.

(Continued on page 20)

Charles Elkind, chairman of public relations

Dennis D. Willard chairman of publications

Harold N. Wells chairman of registration

DATA PROCESSING ENGINEERS

AUTOMATIC PROCESS CONTROL SYSTEMS

Senior level positions open with Division of Ford Motor Company at Newport Beach, Southern California

The Computer Operations of Aeronutronic, a Division of Ford Motor Company, offers unusual career opportunities to engineers experienced in data processing, computer and industrial processing control technology. Men with experience are invited to share in the research, design, development and engineering of highly sophisticated automatic processing control systems for industrial applications requiring the most advanced methods and equipment automation can offer.

Positions are at Aeronutronic's new $22 million Engineering and Research Center at Newport Beach, Southern California—the West's most ideal location for living, working and raising a family. Outstanding Ford Motor Company employee benefits, considered the finest in the industry, are included.

POSITIONS NOW OPEN

PROCESS CONTROL SYSTEM ENGINEERS. Seven to ten years' experience, five closely related to digital computers applied to process control. Equipment and system analysis and design experience required. Experience in equipment for the following types of equipment desired: continuous process control, machine control, batch process control, data logging, production line control. Experience in analog equipment also desirable.

AUTOMATIC MACHINE TOOL CONTROL ENGINEER. Seven years' experience, four in automatic numeric machine tool controls. Equipment design experience required. Experience in analysis of machine control problems and synthesis of control system required, as well as knowledge of machine tools.

INDUSTRIAL ENGINEER (PROCESS CONTROL). Ten years' experience, including work associated with several of the following production lines: job shops, machine tools, quality control, continuous and batch processes. Experience in systems and procedures associated with such systems. Planning and operating experience desired. Ability to apply this experience to studies and designs for automating such processes.

INFORMATION PROCESSING SYSTEM ENGINEERS. Seven to ten years' experience, five in equipment and design for large information system complexes consisting of equipments including: data entry, data transmission, digital computers and data processors, storage and retrieval, buffering, display. Experience as a senior participant in systems such as the following desired: operations centrals, large information coordinating and control centrals, intelligence collecting and processing.

ELECTRONIC INTELLIGENCE SYSTEM ENGINEER. Seven year's experience, three in electronic intelligence data processing systems analysis and design. Equipment design experience required. Experience desired in data requisition, transmission, conversion, analysis, manipulation, and recording.

Concerning these and other important career positions, telephone Mr. R. E. Durant at MAdison 9-5561, Ext. 581. Or, if more convenient, direct a resume to Mr. Durant, Computer Operations, Aeronutronic, Dept. 40_, Ford Road, Newport Beach, California.

COMPUTER OPERATIONS

AERONUTRONIC
a Division of FORD MOTOR COMPANY

NEWPORT BEACH, SANTA ANA AND MAYWOOD, CALIFORNIA
NATICK, MASSACHUSETTS

MORE MOLECULES

good possibilities.

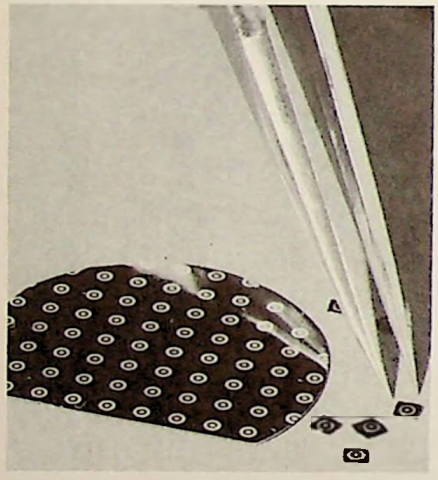
One major problem is the development of adequate excitation sources. The needed intensities of these sources are somewhat larger than are currently available. Design of high-Q cavities for the ultramicrowave region represents another problem. Methods of suppressing undesired modes will be illustrated, and the pertinent equations will be derived.

MEETING AHEAD

Computer Switching

Parametric phase-locked oscillators and Esaki diodes as switching elements will be discussed by Dr. Arthur W. Lo of IBM, Poughkeepsie, N. Y., at the April 26 meeting of the Professional Group of Electronic Computers. Refer to the Meeting Calendar on page 9 for further information.

Lo will speak on the operating principles of phase-locked oscillators and Esaki diodes in detection, amplification, and storing of binary digital information. Various modes of operation for logic and memory applications will be discussed as well as circuit behavior at medium and microwave frequencies.



Double-diffused silicon mesa transistors in the making at Fairchild Semiconductor, showing wafer and dice. Reliability aspects will be among the considerations at the April 19 PGRQC meeting, see Calendar, page 9

MORE WJCC PROGRAM

"MATHEMATICAL APPLICATIONS OF THE DYNAMIC STORAGE ANALOG COMPUTER"

J. M. Andrews, Computer Systems, Inc.

The development of high-speed memory and repetitive operations for the analog computer has tremendously increased the versatility, economy, and speed of solution associated with analog computers. It is now possible, through the time-sharing of computer components and high speed reiterations, to obtain economic and rapid solutions of complex problems that have required too many computer components or too long a solution time to be considered practical for the analog technique.

Different combinations of the new developments are readily employed for the solution of complex problems which fall into four broad categories. The first is the sequential calculation, as encountered in the distillation problem. In this technique, successive solutions to algebraic matrices are obtained from cycle to cycle at a repetitive speed of 60 cycles per second until the problem is solved.

A second category is that of the definite integral. Varying definite integrals are evaluated from one cycle to another and held in memory for the successful solution of optimization problems.

The third category is that of rapid evaluation of multiple integrals. This technique can be employed for the solution of partial differential equations of several types. The last category is one which employs continuous memory for the solution of transient problems and difference-differential equations.

SESSION IIIA

Wednesday, May 4
9:00 A.M. to 12:00 M.

LEARNING AND PROBLEM SOLVING MACHINES

Chairman: Harold Skramstad
National Bureau of Standards

Panelists:
Oliver Selfridge, Lincoln Laboratory, MIT
J. C. R. Licklider, Bolt, Beranek, and Newman, Inc.
H. J. Bremermann, Univ. of California, Berkeley

The development of machines to simulate the behavior of living organisms is a rapidly expanding branch of the computer art. Many papers and several symposia have been devoted to this effort in recent years. For the present session we have selected papers representative of three areas of especial interest to computer designers and users. Dr. Doyle describes a computer program which adapts itself to humanly-important criteria in character recognition, eventually achieving satisfactory performance on its own. Dr. Gelernter's machine, also embodied in a computer program, exhibits inductive and deductive logical powers sufficient to prove geometrical theorems taken from high school final examinations. And, looking forward to the coming decade, Dr. Greene treats the problem of machine symbolization of meaning from the viewpoint of the philosopher and psychologist, and proposes an adaptive model for perception of significant wholes.

These accomplishments in machine learning, problem solving, and perceiving carry us several steps toward the goal of simulating intelligent behavior by machine. They also remind us of the need for contributions yet to be made in formalizing intelligent action so that future machines may be even more useful.

Gene E. Morrison, chairman of local arrangements — *Robert A. Isaacs, chairman of printing*

"RECOGNITION OF SLOPPY, HAND-PRINTED CHARACTERS"

Worthie Doyle, Lincoln Laboratory, MIT

This paper describes a pattern recognition scheme particularly intended to handle noisy and highly distorted data. The sample is subjected to a series of tests. At the conclusion a single decision is made. Though the individual tests may be poor, a reliable decision can be available provided there are enough tests, each contributing some different fractional bit of information. The decision is made on the basis of experience obtained from prior processing of labelled samples. The method has been applied to hand-printed English capitals but is general. Results are given for some trials on the IBM 709.

"EMPIRICAL EXPLORATION OF THE GEOMETRY THEOREM MACHINE"

H. Gelernter, J. R. Hansen, and D. W. Loveland, IBM Corporation

In early 1959, a massive IBM 704 program simulating a machine for the proof of theorems in elementary Euclidean plane geometry ran successfully for the first time, culminating the first phase of a long-range program directed at the problem of intelligent behavior in machines. Since that time, a large number of problems taken from a collection of high school final examinations in plane geometry have been solved by the computer. Some of these problems would be considered difficult by the average high school student. This paper presents the results of a detailed analysis of the problem-solving behavior of the geometry theorem-solving machine.

"A SUGGESTED MODEL FOR INFORMATION REPRESENTATION IN A COMPUTER THAT PERCEIVES, LEARNS, AND REASONS"

Peter H. Greene, The University of Chicago

This paper forms part of a program of investigating mechanisms whereby computers can represent enough of the structure of the precepts and concepts they handle so that they, rather than the human operator, can be said to deal with the meaning of these things. A paper presented at the 1959 Western Joint Computer Conference

(Continued on page 22)

PG ORGANIZATION

Circuit Theory Progresses

Roughly forty signatures have been obtained on the petition necessary for formation of a San Francisco Chapter of the Professional Group on Circuit Theory. Organizational work is being done by R. C. Kiessling, ITT Laboratories, 937 Commercial Street, Palo Alto.

Consideration and anticipated approval for the Section should take place in April and the petition, if approved, will be forwarded to national headquarters for finalization.

With this timetable, an organizing meeting is anticipated for about the second week in May. Direct information will be supplied to PGCT members in the Section. Others wishing to participate should contact Kiessling at the above address or at DAvenport 1-0211. Those wishing to take an active part in the Chapter organization and operation are also invited to contact Kiessling.

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MECHANICAL ENGINEERS:

MECHANISM DESIGN—high-speed, complex devices used in: memory access, input-output elements, card and tape handling mechanisms, hydraulic servos.

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SOLID STATE—explore phenomena of: electroluminescent devices, photoconductor devices, special transistor devices.

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Stereo master control of KGO-AM and FM, one of the facilities viewed by PGA at its March meeting. KGO schedules about an hour and a half of stereo a day

MEETING REVIEW

After Stereo: Ambio?

Plans for the reactivation of both the IRE Audio Chapter and the San Francisco Section of the Audio Engineering Society occupied a substantial part of the attention of those in attendance at the March 1 joint meeting of the two groups. A continuing policy of joint meetings seemed to be favored by those present as a sensible solution to the best possible utilization of manpower in the arrangement of programs.

Following these considerations, J. G. McKnight, manager of the advanced audio section at Ampex, described some of the work his group has been doing and demonstrated one of the interesting effects which had been produced and christened "Ambiophonic Sound".

He pointed out that directional sound had been important in music even from the time of Bach who composed the St. Matthew Passion to utilize divided choirs being heard from different directions. Stereophonic reproduction is the audio engineer's solution to the recreation of that particular effect.

Ambiophonic reproduction, in contrast, is aimed at recreation of the sense of being present in the room in which the original performance was given. The effect is created by recording the program material on one channel with one microphone and the room effects on the second channel by a substantially distant microphone—in the case of the demonstration which followed, about forty feet. Channel 1 is presented through a single speaker system from the front while channel 2 is heard simultaneously over half a dozen "surround" speakers.

McKnight was quick to admit that the commercial possibilities for such a home system are rather meager. Those in the audience who reflected on their wives' reactions to the introduction of speaker system number 2 for stereo, appeared to share this belief.

During the periods when the relatively small groups were being exposed to the ambiophonic demonstration, others were taken on a tour of the new San Francisco facilities of KGO-AM, FM, and TV.

—George Spelvin

Informal discussion at the March PGEC meeting involves G. Tucker, R. Tanaka, Kent D. Broadbent (speaker), and Doug Engelbart

—J. Boysen photo

MEETING REVIEW

Thin Bits

The regular monthly meeting of the Professional Group on Electronic Computers was held in the LMSD Auditorium at Palo Alto on March 22. The speaker was Kent D. Broadbent, formerly of Hughes Research Laboratories but more recently of American Systems, Inc. in Los Angeles. Broadbent spoke on two topics, "An Evaporated Random Access

(Continued on page 24)

MORE WJCC PROGRAM

stated some of the main goals; this paper proposes a model which may achieve some of these goals. The model is intended for that part of a pattern recognizing and discriminating machine which produces stable, meaningful "perceptual units" and is thus intended not to replace, but to supplement, other types of perceiving or reasoning devices.

SESSION IIIC

Wednesday, May 4
9:00 A.M. to 12:00 M.

ANALOG TECHNIQUES

G. A. Bekey and L. W. Neustadt
Space Technology Laboratories, Inc.

Panelists:
G. A. Korn, University of Arizona
Walter Brunner, Electronic Associates, Inc.

The presentation and discussion of three interesting techniques for using analog computers will be the subject of the session. These are concerned with their use in plotting Bode and Nyquist diagrams; the reduction of error by use of constraint equations; and the use of parameter influence coefficients obtained simultaneously with the problem solution.

"ANALOG COMPUTER TECHNIQUES FOR PLOTTING BODE AND NYQUIST DIAGRAMS"

G. A. Bekey and L. W. Neustadt, Space Technology Laboratories, Inc.

Two methods of plotting Bode and Nyquist diagrams with an analog computer are presented. Both methods yield the open-loop response from a closed-loop simulation on the computer, which makes them applicable to systems with open-loop poles in the right-hand plane. Neither method requires any adjustment by the operator, other than to change the frequency of the input signal.

The first method makes use of some trigonometric identities, which yield functions which identically equal the real and imaginary parts of points in the Nyquist diagram. It makes extensive use of multiplying equipment; no other nonlinear equipment is required.

The second method makes use of diode and relay switching techniques to measure phase; and peak value readers to measure amplitude. One divider and no multipliers are used, but diodes and relays are necessary.

"ON THE REDUCTION OF ERROR IN CERTAIN ANALOG COMPUTER CALCULATIONS BY THE USE OF CONSTANT EQUATIONS"

R. M. Turner, Lockheed Aircraft Corporation

This paper describes a method of reducing the error in certain analog computer calculations by the negative gradient techniques where one has additional information about system performance in the form of constraint equations. In general, the technique leads to correction terms which are introduced into the system differential equations in some cases the desired system solution is obtained by operating directly with the constraint relations.

The method is applicable to systems described by algebraic or differential equations, or both.

"THE USE OF PARAMETER INFLUENCE COEFFICIENTS IN COMPUTER ANALYSIS OF DYNAMIC SYSTEMS"

Hans F. Meissinger, Hughes Aircraft Company

A new computer technique is described which yields the partial derivatives of problem variables with respect to pertinent parameters of a system simultaneously with the solution of the original system differential equations. These derivatives, known as parameter influence coefficients, are valuable to the analyst in enhancing his understanding of system characteristics. If the problem

(Continued on page 24)

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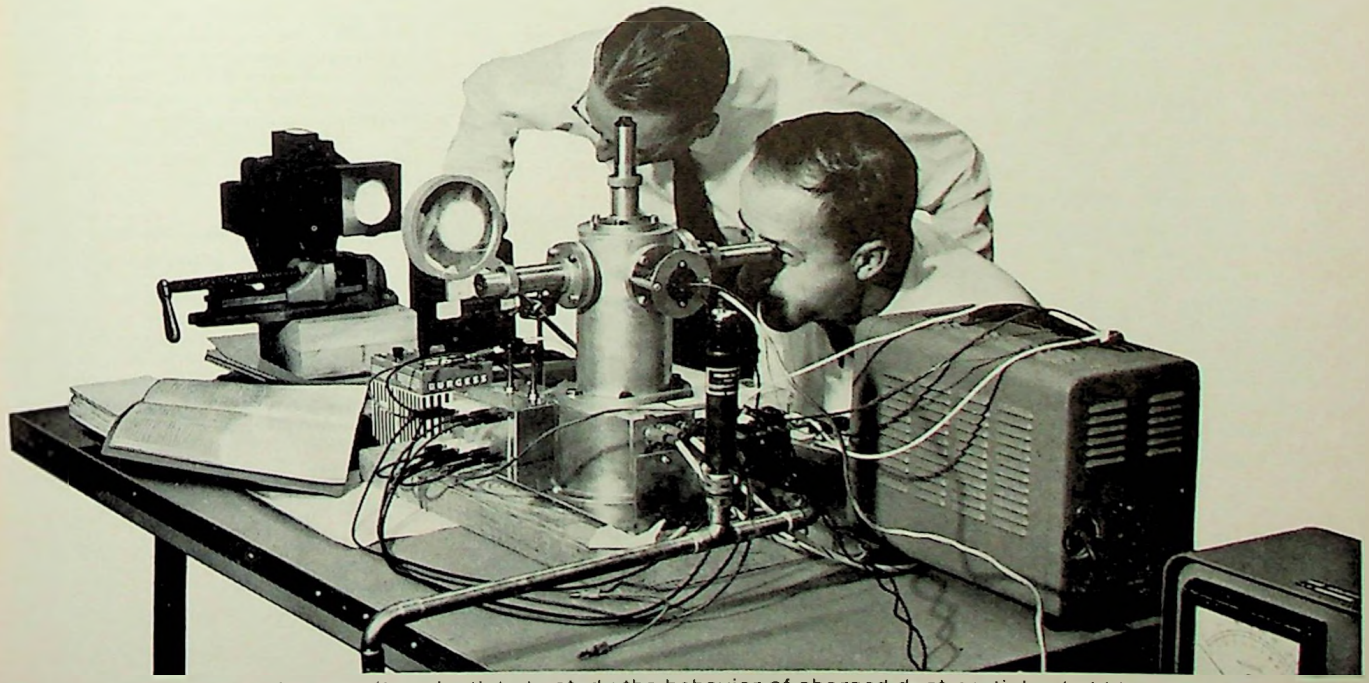

An electron device permits scientists to study the behavior of charged dust particles held in suspension.

Doug Perham, Vic Corey, and Earl Goddard look at the short-waisted Maryann generator in the Perham collection

—Tom Townsend photos

MORE BITS

Memory" and "A Thin-Film Magnetic Shift Register."

Both of the topics were on work done at Hughes and were examples of very thin evaporated magnetic films used as storage or memory devices. The random access memory described had a total of 19 layers of which 4 were magnetic films. The remaining layers were conductors and insulators. The memory described required a selection current of 250 milliamperes and produced a read-out voltage of 0.1 volt. The turn-over time was approximately 30 millimicroseconds. The cell sizes were 200 mils square although it would be possible to make them as small as 30 mils.

The shift register incorporating thin-film technology was also made up of many layers. The first layer deposited on a substrate was the writing electrode—a copper conductor. The next layer was the magnetic film itself followed by two layers of propagating electrodes which were copper conductors. When these electrodes are pulsed in the proper sequence, they provide a shifting magnetic field. The field is not of sufficient magnitude to cause a change in the field of the magnetic film but causes the walls of the written bit to be moved. As a result the bit or bits propagate down the strip of magnetic film. The top layer is a probe which senses the information in the register. Each of these layers is separated by layers of insulation. A register with 50 bits to the inch can be shifted at rates up to one megacycle. Broadbent showed motion pictures of the shift register shifting a single bit at a slow rate. It was possible to see the area where the bit was in the register by the use of the Kerr magneto-optic effect.

The thin film register and memory demonstrated a potentially inexpensive, high-speed, miniature storage device for use in computer systems of tomorrow.

—J. A. Boysen

MEETING REVIEW

An Evening in the Country

About forty members or guests, with a sprinkling of their ladies, made the trek to New Almaden to help make the opening of the Perham Foundation Museum official.

Of course a historical ribbon was cut with a historical pair of scissors in the hands of Mrs. Douglas Perham, as the picture shows. This followed remarks by Earl Goddard, chairman of the Sec-

(Continued on page 26)

Formality of ribbon cutting done in the old-fashioned way at the Section meeting in New Almaden

MORE WJCC PROGRAM

solution x (t, λ) and the parameter influence coefficient $\partial x/\partial\lambda$ (t, λ) are known for a particular operating point where $\lambda = \lambda_0$, then it is possible to make a first order prediction of system behavior at a neighboring point having the new parameter value $\lambda_1 = \lambda_0 + \Delta\lambda$. Similar predictions can be made if several parameters are varied. Thus, the knowledge of parameter influences often helps to reduce the total number of computer runs required in a parametric system study. Typical applications of the technique are: linear extrapolation in the neighborhood of a known solution; determination of design tolerances of a system; prediction of critical parameter values; and stability boundaries. The most useful application pertains to systems disturbed by random noise where normally a very large number of computer runs would be required to analyze the system on a statistical basis in a variety of operating conditions.

SESSION IVA

Wednesday, May 4
2:00 to 5:00 P.M.

TRENDS IN COMPUTER APPLICATIONS

Chairman: Thomas W. Wilder, Broadview Research Corporation

Panelists:
Clair E. Miller, Electronic Computing Center, San Francisco
A. R. Zipf, Bank of America
George W. Evans, Stanford Research Institute

A major trend in applications of digital computers is toward an increased interest in problem areas which combine features of scientific computing and data processing. The trend has important implications not only for users of computer-obtained results, but also for the programmer and hardware designer.

New potential areas of computer applications will be discussed. The economic feasibility of these applications will be emphasized.

"DATA PROCESSING—WHAT NEXT..."

John M. Salzer, Ramo-Wooldridge Corporation

This paper reviews in broad terms past accomplishments in the data processing field. It will try to examine and assess future trends and developments in components and circuits; computers and equipment; system design; programming and language problems; human factors and over-all systems problems; learning machines and cerebral systems; unusual applications; and some of the effects of these developments.

"THE OUTLOOK FOR MACHINE TRANSLATION"

Franz L. Alt, National Bureau of Standards

The current status of the major research projects concerned with the use of computing machines for the translation of natural languages (e.g., Russian to English) is surveyed. None of these projects has reached the stage of fully automatic translation of satisfactory quality. The difficulties encountered fall into two main classes: semantic and syntactic. Several methods of approach have been used to overcome them; these are surveyed, and the approach of the National Bureau of Standards is described in more detail. It appears likely that within a few years automatic translation of fair quality may be possible, at a cost substantially below that of human translation. The major cost elements—initial development of machine programs, cost of machines and of operation—are analyzed as to their dependence on the method of translation and on the type of equipment used.

(Continued on page 26)

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- ☐ G Software Engineering
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- ☐ I Production/Manufacturing Engineering
- ☐ J MTS
- ☐ K Other_____

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- ☐ N Marketing/Sales
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- ☐ Q Student

3. What type of design are you involved in? (Check all that apply)
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- ☐ U Test & Evaluation
- ☐ V Systems Design
- ☐ W Circuit Design
- ☐ X Component Design
- ☐ Z Microprocessors for Embedded Systems
- ☐ Y Other Design_____

4. Estimate the total number of employees at your company (Check only one)
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- ☐ BB 1,000 - 4,999
- ☐ CC 500 - 999
- ☐ DD 100-499
- ☐ EE 50-99
- ☐ FF 1-49

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- ☐ II 1-5 years

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6. What is the primary end product at your location? (Check only one)
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- ☐ AE Computers, Systems & Peripherals
- ☐ AF Communications/Networking Equipment
- ☐ AG Controls, Test, Medical Equipment
- ☐ AH Consumer Electronics & Appliances
- ☐ AI Contract Manufacturing
- ☐ AJ Electronic Instrumentation, ATE, Design & Test Equipment
- ☐ AK ICs & Semiconductors
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7. In my job I recommend, specify, purchase or influence the purchase of (Check all that apply)
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- ☐ CL Computer Systems/Subsystems
- ☐ DR Computer Peripherals
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- ☐ OJ Test & Measurement Equipment
- ☐ PA Other_____ (please specify)

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At the joint February meeting between PGCS, PGAP, and PGMIL, Ray Vincent, SRI; and Ralph Clark, DOD (speaker); pose with PGCS Chairman Alan Waterman, Stanford; and PGMIL Chairman Major Otis Hill, ARDC
—Ken Patterson photo

MORE COUNTRY

tion Historical Committee; Vic Corey, chairman of the Section; and Doug Perham, who told how George Westinghouse got him started collecting artifacts at the time of the Chicago World's Fair when Perham was just a boy.

For the rest of the evening the visitors wandered about the sparkling premises exclaiming about various historical items upon which some of them had cut their electronic eye-teeth. Everyone seemed to have a good time.

—*George Spelvin*

MEETING REVIEW

Challenging Ma Bell

Problems of military-communications management in the U.S. started nearly 100 years ago, and haven't been solved yet. Secretary Stanton, in 1863, ordered Colonel Myer, the chief signal officer, to turn all of his telegraph operations over to the Quartermaster General. The ensuing rumpus resulted in the transfer of the chief signal officer to the Department of the Mississippi.

This historical note opened an interesting talk by Ralph Clark, assistant director of communications of the Department of Defense research and engineering, at the February meeting of the PGCS which was jointly held with PGAP and PGMIL. He discussed the technological revolution that has occurred since the introduction of electrical communications to military operations. As a result of evolution and separate requirements, the Army, Navy, and Air Force each has built up somewhat similar systems to a globe-girdling extent.

Clark noted that the three large long-line systems of the Army, Navy, and Air Force provide the bulk of communications capacity external to the U.S. for the various commanders and for the

(Continued on page 28)

MORE WJCC PROGRAM

"COMPUTERS FOR ARTILLERY"

Lt. Colonel Louis R. van de Velde, U. S. Army and Missile School, Fort Sill

The Army is developing computers which will perform complex mathematical and technical tasks in tactical units in forward areas, and which will aso be components of data processing system. The complete system will perform nearly a hundred tasks, ranging from the vital, complex mathematics of ballistics for artillery missiles and cannon to complete accounting of logistical requirements.

Of the Army's combat arms—infantry, armor, artillery—the artillery holds a unique place with respect to digital computing. The artillery stands at the point in the field army at which technical, mathemaical computing meets automatic data processing—the instrument of logistics, battlefield management and command.

The paper points out that with digital computing, even conventional "old-fashioned" cannon take on new power because the increased accuracy of the solution to the gunnery problem permits fire on targets without adjustment.

Gains foreseen from a complete data processing system are imposing. But, it is pointed out, the Army must organize its computer efforts so that small computers in forward areas can serve as powerful, relatively autonomous instruments as well as initial processors for data which is input to larger processors at centralized points. This concept of having small computers serve as members of a system, but still remain effective instruments when isolated, is called the "federal-state" approach.

SESSION IVB

Wednesday, May 4
2:00 to 5:00 P.M.

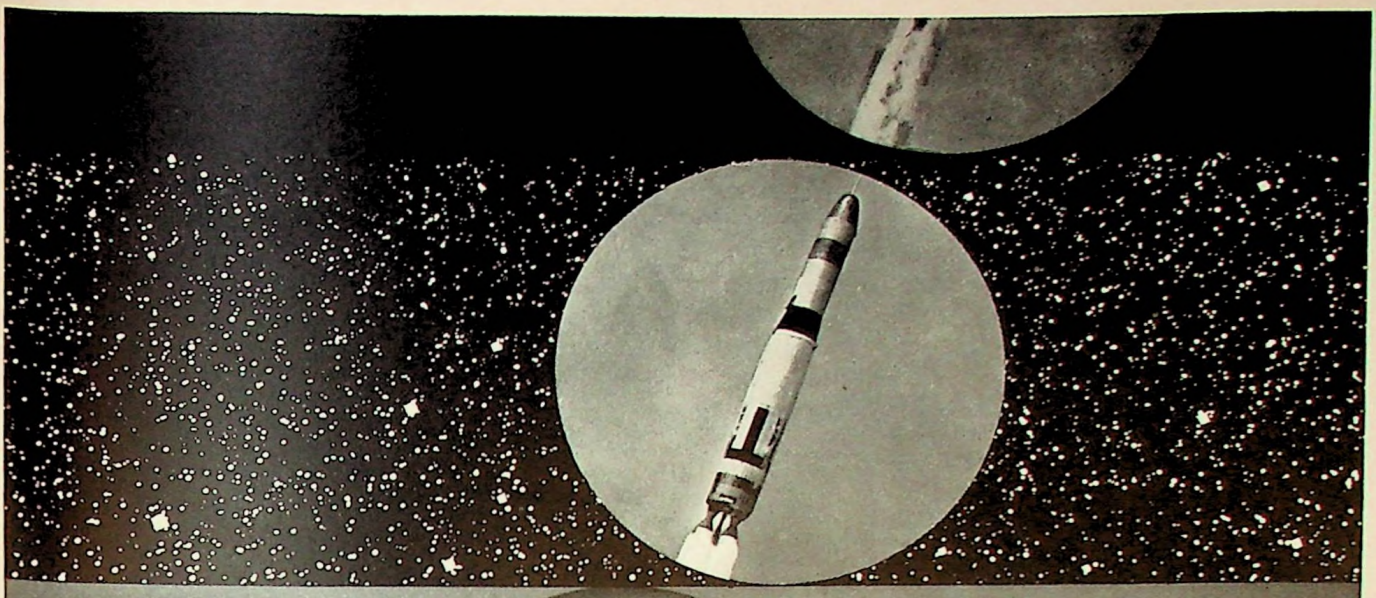
LOGICAL DESIGN

Chairman: Richard I. Tanaka, Lockheed Aircraft Corporation

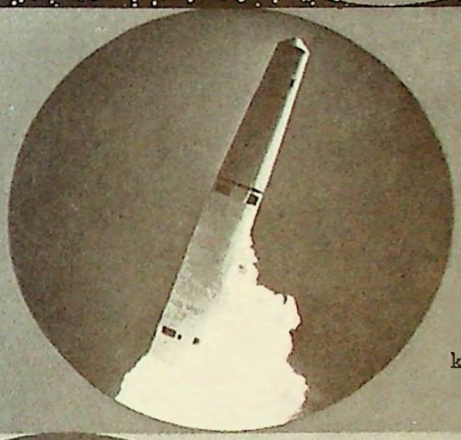
Panelists:
A. Jennings, California Computer Products
D. Aufenkamp, General Electric Company
B. Elspas, Stanford Research Institute

The area encompassed by computer logical design is wide and varied. Efforts in this field range from research of an entirely theoretical nature to the investigation of

(Continued on page 28)

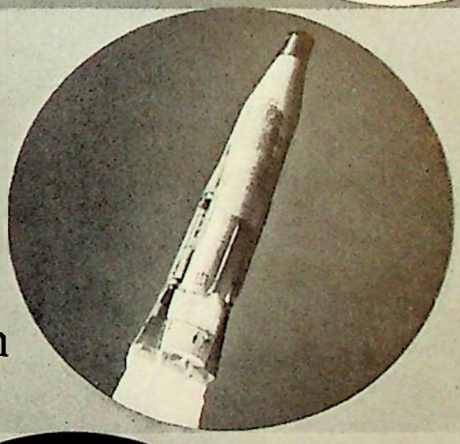


Building Strength Upon Strength... the USAF Ballistic Missile Program



The strength and prestige of this nation depends upon many things... important among these are the successes of the Air Force Ballistic Missile Program and related advanced space projects.

In turn, these programs depend upon the continuing flow of new ideas and inventions. All of these are part of a common pool of knowledge and know-how which are drawn upon for today's capability and tomorrow's advances.



In building strength upon strength in the race for space technology leadership, the knowledge and experience gained from Atlas, Thor, and Titan ballistic missile systems developement is being applied to advance Minuteman. For these programs, under the management of the Air Force Ballistic Missile Division, Space Technology Laboratories has had the direct responsibility for over-all systems engineering and technical direction. As these ballistic missile and related space programs go forward, STL continues to contribute technical leadership and scientific direction.

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readiness, administrative, and logistic support of the U.S. combat forces deployed from Formosa to Turkey. The Air Force has built a number of vhf ionospheric scatter and uhf tropospheric scatter systems and has additional ones under construction or planned. The Army recently completed a vhf scatter system from Hawaii west across the Pacific. Interwoven into the trunk system of the domestic common carriers and extending overseas through allocated channels in the various military systems are 15 or 20 different defense networks. Probably the largest of these are the SAC communications network and the SAGE system. The Air Force's planned COMLOGNET is an example of a large logistics system.

Some measure of the size of the networks can be gathered from the fact that we have leased some 5 million voice-channel miles, mostly in continental North America, and the equivalent of probably 30 telephone channels across the Atlantic and 20 or more across the Pacific. This Defense communications complex is exceeded only by those of the AT&T Company and the Soviet Ministry of Communications. There is a move afoot in the DOD to consolidate the long-haul point-to-point portions of the three defense networks into a single operating system. The extent to which complete integration of management will be achieved has not been determined. Probably the management will be through the Joint Chiefs of Staff.

Where transmitting- and receiving-station sites can be properly located, scatter systems are offering a very worthwhile addition to h-f. Active investigation is also being made on the uses of meteor reflections to provide communications.

On the side of terminal switching equipment, Clark noted that we will see widespread re-engineering of the defense communications system to employ extensive circuit switching for handling voice, teletype groups, and data such as digital information. The circuit-switching facilities will be augmented by message-switching systems providing much advanced capability for automatic handling of the message routing, etc.

The largest problem is the growing use of automatic information-handling systems employing large computer-like devices for data processing. In the aggregate, these new systems make the SAGE system and the NIKE-ZEUS anti-missile missile system look simple by comparison. One command system contemplates the handling of upwards of 40,000 messages in 15 minutes following an alert warning.

(Continued on page 30)

MORE WJCC PROGRAM

techniques directly related to hardware realization of digital machines.

The sampling of papers for this session obviously cannot represent logical design activities in the larger sense; the papers do describe new techniques and new points of view and will serve to stimulate thought and indicate directions of planning of computers for the next decade.

"COMMUNICATIONS WITHIN A POLYMORPHIC INTELLECTRONIC SYSTEM"

George P. West and Ralph J. Koerner, Ramo-Wooldridge Corporation

With increased automation of large-scale data processing applications, the trend has been to larger memories, higher clock rates, and increasingly complex arithmetic units. This approach is not entirely satisfactory, particularly from cost and reliability standpoints. A multiple-computer approach, employing several computers of intermediate capacity, provides many advantages in addition to those of cost and reliability.

An efficient multi-computer system requires effective communication of data and control signals between modules of the system. The RW-400 Data Processing Central, a new polymorphic data processing system, is described. The communications problems associated with such a system are discussed. A high-speed electronic switch is described which employs multiple aperture magnetic cores to provide system communication. The paper explains the utilization of this high-speed switch in providing efficient data communication as well as effective control of the system modules.

"ENCODING OF INCOMPLETELY SPECIFIED BOOLEAN MATRICES"

T. A. Dolotta and E. J. McCluskey, Jr., Princeton University

The problem discussed in this paper is a generalization of the problem of choosing the binary codes for the various operations of a digital computer with a view toward minimizing the gating circuitry in the computer's central control. The general procedure is a systematic method for the simultaneous encoding of a large number of arbitrary Boolean functions in an economical manner. The method is applicable to those cases where the designer is allowed to choose the independent variables to minimize the circuit which realizes the given Boolean functions. Other applications are indicated. The method includes a means for determining a lower bound on the cost of the circuit which realizes the given Boolean functions. The entire procedure is systematic and lends itself well to mechanization via a digital computer program. A discussion of the advantages and limitations of the method is included, and the method is compared with a previously published procedure for attacking the same problem.

"A BUILT-IN TABLE LOOKUP ARITHMETIC UNIT"

R. C. Jackson, W. H. Rhodes, Jr., W. D. Winger and J. G. Brenza, IBM Corporation

A novel approach to arithmetic operations in digital computers is described which requires fewer stages of logic and fewer components than conventional adder circuitry. This is accomplished by using the decimal digits in an arithmetic field to complete memory addresses which in turn are used to reference a set of answers pre-stored in magnetic core storage. Multiple non-contiguous memory addresses stored in the machine hardware reference the various digit positions of the sum, difference, or partial product at the proper time in the arithmetic cycle to develop the result. The accuracy of all results is easily verified by simply performing an automatic validity check on the data paths within the computer system.

The machine operator need not concern himself with the "hardware" method used within the computer, since the arithmtic commands commonly found in digital computers (Add, Subtract, etc.)

(Continued on page 31)

FOR

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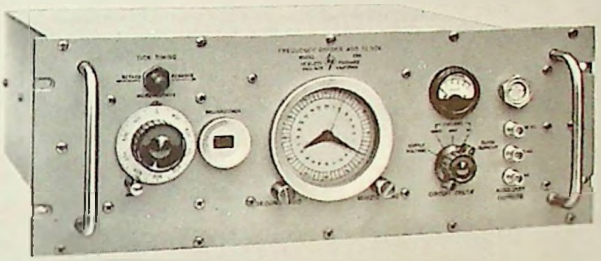

This new hp 113AR Frequency Divider and Clock makes possible precision time comparisons between stable oscillators and standard WWV or other transmitted time signals. This permits adjustment of frequency or time standards for greater absolute accuracy, and simplifies obtaining detailed records of drift rates, or time or frequency differences between oscillators in widely separated systems.

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In the future we have planned several systems based upon the use of devices in space which can provide a large contribution to defense communications capabilities. A good example is the repeater-type equatorial satellite based on the principle demonstrated by the Army in 1958 when the President's Christmas message was repeated. Another system will require a family of carefully controlled satellites in polar orbits to provide communications to polar regions. Passive reflectors in space, including a large balloon as demonstrated in the recent tests by NASA, have also been proposed.

In the more distant future we have the 24-hour synchronous satellite system operating above a fixed spot on the equator. To be technically useful and economically feasible, such a device will have to be of substantial size and weight and the attainment of such a system cannot be foreseen short of 1966. *—Ken Patterson*

MEETING REVIEW

Electronics Abroad

Recent experiences in the electronic art at Saclay, France, with comments on other European activities, were presented to the East Bay Subsection at its February meeting by Quentin A. Kerns of the Lawrence Radiation Laboratory, Berkeley.

In addition to his work with the French AEC at Saclay, Kerns told of visiting laboratories at Harwell, England; Geneva; Milan; and Holland. His talk generally had to do with different techniques used in particle tracking. Among interesting sidelights was the use of an analog computer to control the water level of 25 major Holland canals, and a geo-magnetic detector for uranium, utilizing a Hall crystal in conjunction with Mumetal horns.

—E. A. Aas

MEETING REVIEW

Color on Tape

When the East Bay Subsection met in the middle of March, forty-two people were in attendance to hear about the development and use of magnetic recording for color television from Joseph Roizen, manager of Videotape products for Ampex Corporation, Redwood City.

Roizen's talk extended from the invention of magnetic recordings in Denmark in 1898, to the Moscow Exposition of 1959. With the use of visual aids, he discussed the problems of putting television on magnetic tape. In the course of the discussion it was noted that some 600 Videotape recorders have been distributed throughout 31 countries. A 94-minute program can

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MORE WJCC PROGRAM

are available in the instruction set for the system shown; table lookup circuitry does the work.

SESSION IVC

Wednesday, May 4
2:00 to 5:00 P.M.

PANEL DISCUSSION
HOW WELL ARE WE PROCESSING OUR OWN INFORMATION?

Panelists:
Sandy Lanzarotta, Editor, "Datamation"
Jackson W. Granholm, Editor, "Computing News"
Fred Gruenberger, News Editor, "Communications of the ACM"

Three editors of magazines which cover broad areas of the information-processing industry will discuss the dissemination and circulation of information in this industry.

The discussion will cover the generation of information by manufacturers, the exchange of information among users and the part played by individuals in making their ideas and opinions known.

Two panel members intend to explore manufacturers' public relations efforts, their methods of releasing news and articles, the quality and accuracy of their advertising, and the methods employed in sales efforts.

Another panelist will review communications problems common to users. Considered specifically will be the apparent absence of any kind of contact between users engaged in scientific computer applications and those in business data processing.

And, finally, the individual's place in the communication picture will be reviewed. Such questions as "How can he influence the flow of information?" "Where are his loyalties (how much can he disclose)?" "What are his responsibilities at computer conferences?"—these and many others will be discussed.

After the panelists have presented their views, audience participation will be invited.

CONFERENCE BANQUET

Speaker: Prof. Heinz Von Foerster
"LIVING COMPUTERS"

Jack Tar Hotel Ballroom
MAY 4 — 6:30 P.M.

SESSION VA

Thursday, May 5
9:00 A.M. to 12:00 M.

DESIGN, PROGRAMMING, AND SOCIOLOGICAL IMPLICATIONS OF MICROELECTRONICS

Chairman: Louis Fein,
Consultant, Palo Alto

Secondary emission vacuum elements, magnetics, semi-conductors, cryogenics, and ferroelectrics, etc., are being studied and researched for use in systems variously called microelectronic, or microminiaturized, or molecular electronic. A few people are concentrating their attention on the kinds of computers they would build out of such components and systems, if they were available. Still others are thinking about how they would program such computers; finally, the sociological implications of having and using such programmed computers are contemplated. From among all these possibilities in hardware, design, programs, and uses, the speakers in this session will pursue one of the large variety of potential chains of implications of microelectronics.

This sequence of four papers covers the following topics: (1) design problems in developing one class of microelectronic components, structures, and systems; (2) how

(Continued on page 33)

Last meeting of the mmz series of PGMIL/PGPT/PGRQC featured these panelists: Major Otis R. Hill, ARDC; W. Dale Fuller, LMSD; Charles A. Rosen, SRI; and James Nall, Fairchild

—John W. Hall photo

MORE COLOR

be recorded on a reel containing 4800 ft. of 2-in. tape weighing only 18 pounds, by transporting the tape at 15 inches per second and revolving the four recording heads 240 times per second.

Roizen made a smooth transition from the technical discussion to illustrated anecdotes of his 11 weeks in Moscow with the American Exposition. The general impression received was that, although Russia has made tremendous strides in education and technology, everyday life is quite drab, with uniformity being evident, and with shoddiness, indifference, and even ineptness being the rule in all the trades from food preparation to building construction.

—E. A. Aas

MEETING REVIEW

Whither MMZ?

Early in March, the IRE Professional Groups on Military Electronics, Production Techniques, and Reliability & Quality Control held a joint session on the future of mmz, if we may apply the principles of the art to the word itself—"microminiaturization."

The panel members were Major Otis Hill, ARDC, USAF; Dr. James Nall, Fairchild Semiconductor; Dr. Charles Rosen, SRI; and W. Dale Fuller, Lockheed Missiles & Space Division; with C. Bruce Clark, SRI, as coordinator.

Each panelist gave a short summary of his views and position in this area, and then opened the floor for questions and discussion.

Hill: Most of the funding for the development of miniature electronic systems has come from the military. Molecular electronics is not looked upon by the military as a replacement for all existing packaging systems, but rather as a new type to fill a specific need. Most of the known packaging techniques will find a place in military systems for a good long time. A great deal of research is needed on the basic properties of materials in new and strange environments—particularly extreme high-radiation fields, and this probably will be done at universities. Military requirements and performance specifications of systems are generally well beyond the state-of-the-art (this

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MORE WJCC PROGRAM

this class of components, structures ,and systems might be put together to implement the logical design of one kind of computer; (3) how this kind of computer might be programmed for one type of use—as an "intelligent technician"; (4) what the potential of such an "intelligent technician" might be as an aid to the solution of the bargaining problem.

"ON MICROELECTRONIC COMPONENTS, INTERCONNECTIONS, AND SYSTEM FABRICATION"

Kenneth R. Shoulders, Stanford Research Institute

Microelectronic data processing systems are analyzed and various requirements for components are considered. The rapid reduction in transmission line cross-section upon scaling down causes increased losses in microelectronic systems, thus giving rise to the need for high impedance components for non-cryogenic applications. A new component is proposed that seems particularly suited for microelectronic system requirements and fabrication methods. This component is based upon the quantum mechanical tunneling of electrons into vacuum; has an estimated switching time of 10^{-10} seconds; promises immunity to temperature variations; and seems adaptable to self-forming manufacturing methods giving component uniformity. A method of electron beam micromachining for film materials is presented in which a thin chemically resistant film is formed with an electron beam to selectively protect the film being machined during a subsequent molecular beam etching. This high speed process has resolution capabilities of several hundred angstrom units; can process electronically clean materials with minimum contamination; and may ultimately be suited for the economical production of one cubic inch data processing systems having 10^{11} active components.

"ON ITERATIVE CIRCUIT COMPUTERS CONSTRUCTED OF MICROELECTRONIC COMPONENTS AND SYSTEMS"

John H. Holland, University of Michigan

Computers constructed of hundreds of millions of logic and storage elements will require an organization radically different from computers currently being produced if these elements are to be used efficiently. It should be possible to process arbitrarily many words of stored data at the same time, each by a different sub-program if desirable. Furthermore, the structure of the computer should be iterative or modular in order to allow efficient use of template techniques in its construction.

A mathematical characterization can be given of a broad class of computers satisfying the conditions just stated. The paper will discuss one example of such a computer—intended as a prototype of a practical computer. A summary of the mathematical characterization will follow the example in the published version.

This paper represents the second step in a program aimed at establishing a theory of adaptive systems. The first step required a "computer" within which the structure and behavior of any growing automation could be simulated (see Proc. of 1959 EJCC). This paper presents the generalization of step one to a broad class of such systems, of arbitrary geometries, etc. Step three involves definition, within the mathematical characterization, of the concept of automation generators (near completion), and step four will investigate the selection and adaptation within this formalism.

"ON PROGRAMMING A HIGHLY PARALLEL MACHINE TO BE AN INTELLIGENT TECHNICIAN"

Allen Newell, The Rand Corporation

This paper speculates on how to program a machine that is suitable for microelectronic com-

(Continued on page 35)

MORE MMZ

may merely mean that the more we learn to do, the more the military wants done).

Nall: Fairchild has an internally funded program for developing a compatible family of functional building blocks. The future of molecular electronics lies in designing this family, from which systems can be logically designed. Fairchild has approximately 23 people actively engaged in this development and expects to exploit as much technology from solid-state physics as is possible.

Rosen: When speaking of the future of mmz, system thinking is required. To achieve system functions in large systems it would be highly desirable to be able to interconnect a very large number of very cheap small components in some redundant fashion, not merely parallel paths, to permit the achievement of this system function even though a high component failure rate was present, particularly if, as the component failure number increased, the system degraded gradually rather than catastrophically.

Thinking in these terms we can depart drastically from the concept of components as resistors, capacitors, inductors, and gain or active elements, and think only of terms of active elements, conductivity, and dielectrics.

Fuller: All component types presented to date intimately depend upon a fabricating technique or packaging and inter-connecting scheme for their success in a system. All such component developments require new concepts in system design. Some general requirements that must be kept in mind, from a system point of view in selecting a given scheme of components, are: (1) its reliability, (2) its productibility, (3) its miniaturization, or packing density, (4) its cost, and (5) its maintenance or maintainability. The ordering of these five general requirements can be changed drastically depending upon the use and sponsor of the particular system. For instance, the maintainability of a satellite is very low, and for most commercial systems cost is one of the more important requirements. Before a component is useful to a system it needs to (1) be made of stable material, (2) put together by reproducible processes, and (3) be formed in such a manner that there is a good fabricating technique for the system to be built of these components.

The open discussion centered in two general areas, one on mil-specs and the use of mmz techniques on military systems where a mil-spec did not yet exist, and (2) more detailed explanation of the type of mmz proposed by Rosen.

—Steve Miller

MORE WJCC PROGRAM

ponents to be an intelligent technician. The point of departure is from the class of machines described by J. H. Holland in a concurrent paper entitled, "On Iterative Circuit Computers Constructed of Microelectronic Components and Systems." These machines consist of a regular lattice of active modules, each possessing both processing and memory functions. The goal is a machine with the problem solving capabilities of a smart human technical assistant, and the mass processing capabilities normally associated with digital computers. This goal is chosen because it coincides wth many current developments. It is conservative as it can probably be achieved on machines built with current digital techniques.

The vision of the eventual capabilities of the machine is discussed more fully. Then, the more striking features of Holland's machines are brought out and the difficulties they present noted. The requirements that are desired of the processor for intelligence, knowledge, communication, and efficiency are considered in turn. For each of these some insight is provided into the crucial problems posed by Holland's machines and some of the directions for possible solutions are given.

"ON A POTENTIAL CUSTOMER FOR AN INTELLIGENT TECHNICIAN"

C. West Churchman, University of California, Berkeley

This paper will take off from the discussion contained in the paper by Allen Newell, entitled "On Programming a Highly Parallel Machine to be an Intelligent Technician." It will raise the question of the potential consumers of the kind of program which Newell discusses, namely, the computer which is in effect a "large-scale" intelligent technician. The paper will mention problems of the applications of management science to the business firms which such a computer might sensibly be called upon to handle.

Attention will then be directed to the major management problem of finding an optimal solution for a group whose objectives differ: i.e., the bargaining problem. The question arises whether Newell's intelligent technician could be of significant service in cracking this problem. One trouble with translating a labor bargaining problem into a game theory structure is the subtle problem of ascertaining restraints and pay-offs, as well as alternatives. Indeed, these usually develop as the bargaining goes on. Perhaps an intelligent technician could assist the bargainers by forecasting outcomes given a tentative list of restraints and a set of personal judgments about outcomes. The technician might also in some sense learn about a particular bargaining problem. If it could do this, then perhaps what it would tell the bargainers would be a better basis for ascertaining their values than their own conscious reflection could supply unassisted.

SESSION VC

Thursday, May 5
9:00 A.M. to 12:00 M.

ANALOG APPLICATIONS

Chairman: Louis B. Wadel, Chance Vought Aircraft, Inc.

Panelists:

John H. McLeod, Convair Astronautics
Donald F. Zawada, Ford Motor Company

Simulation, the substitution of elements having mathematical properties in common with the system to be studied, facilitates the studies in a number of ways: (1) it permits relatively inexpensive laboratory investigations of complex dynamic systems in advance of construction to verify proper operation; (2) it makes possible the rapid trial of many possible designs to aid optimum

(Continued on page 37)

Cutting the birthday cake at the second anniversary of WAEI's founding; Sara Wilson, president, is watched with interest by Walter Lawton, SRI (speaker of the evening); Mrs. Paul Justice, program chairman; and Mrs. Joyce Stone, treasurer

WAEI

Helium & Birthday Cake

High-speed photography, according to Walter Lawton of Stanford Research Institute, is not fancy and involved, but actually ridiculously simple. And indeed he made it seem so to the members and guests of the Women's Association of the Electronic Industry.

Although beset by such difficulties as a blown fuse and a blown projector bulb (and no replacement bulb) Lawton managed somehow to surmount these frustrations and enlighten and delight his audience.

Illustrating the simplicity of high-speed photography, Lawton demonstrated a Fastax camera, driven by two vacuum cleaner motors (because that's what they had on hand when they were developing it) and employing a rotating prism. He explained how it is possible to get pictures at the rate of 7,000 frames per second, as contrasted to the ordinary motion picture rate of 64 frames per second.

If 7,000 frames per second isn't fast enough for you, Lawton pointed out that the Beckman & Whitley Model 189 Framing Camera, made right here in San Carlos, takes pictures at the rate of 4,300,000 per second. He explained why the mirror is rotated in a helium atmosphere, why you only get 25 frames on a piece of film, why a special housing is required for the mechanism, and why it takes a lot of electronics to control the unit.

He did not explain why the sea is boiling hot, perhaps because he felt it was not pertinent. But he did clarify pulse generators and pips, detonators and goose controls, and why it is necessary to have, instead of an ordinary focusing cloth of black cambric—one made of sumptuous red and purple with gold fringe all around.

Lawton stated that engineers are needed to do the real work in the field of high-speed photography. Pictures like these aren't worth much without timing and data reduction, and this is where the engineers come in.

Lawton, who has been with SRI for eleven years, is manager of photographic services. He is a past president of the Society of Industrial Photographers and holds many merit awards from the Professional Photographers of America.

The Women's Association now has a membership of nearly 100, encompassing all phases of activity in the electronic field. Dinner meetings are held the third Monday of each month. Next meeting will be April 18 at the Old Plantation in Los Altos. Dinner is at 7:15; hospitality at 6:30. Guests (female) are cordially invited.

—*Mary Haylock*

MEETING REVIEW

Forging Ahead With Words

The Professional Group on Engineering Writing & Speech met on March 15 at the Lenkurt Electric Company plant. Speakers for the evening were Hyman Olken of the Lawrence Radiation Laboratory at Livermore and chairman of the San Francisco Chapter of PGEWS, and Emlen Littell, an editor at the Stanford University Press. The topic was "Career Advancement in the Technical Writing Field"; Olken devoting himself to government and industry manuals and sales promotion literature, Littell to university presses and trade publishing.

Of special interest were Olken's remarks on illustrating principles and practices and the examples he displayed. His suggestions on how to make sales literature live so that editors will print the story were thought-provoking and helpful.

Littell's remarks on university presses and the trade publishers pointed out the advantages and disadvantages of each. Better working conditions, emphasis on

(Continued on page 39)

system synthesis; (3) it provides means for operator training at drastically reduced cost and with the elimination of danger to operator and the system. Applications of these types are discussed in the first two papers.

An electronic analog computer offers a convenient, flexible means of simulating dynamic systems. The procedure involved in constructing a simulation program is normally straightforward, but it becomes tedious for large problems which may require the inter-connection of several hundred separate elements. Since the construction of the program is a logical procedure, it seems reasonable that a digital computer can be used to program an analog computer automatically; this idea is explored in the third paper.

"REAL-TIME AUTOMOBILE RIDE SIMULATION"

Robert H. Kohr, General Motors Corporation

Automobile ride studies have progressed from simple linear analyses to complex non-linear simulations performed by real-time computers. A complete study of automobile ride must include the road (input) waves, car suspension dynamics, and passenger response to resulting ride motions. A Ride Simulator capable of carrying two passengers and subjecting them to realistic ride motions offers a new approach to automobile suspension design. The basic simulator, which consists of a magnetic tape input unit, an analog computer for determining car ride motions in real time, and a servo-controlled motion simulator are described.

"USING AN ANALOG COMPUTER FOR BOTH SYSTEMS ANALYSIS AND OPERATOR TRAINING ON THE ENRICO FERMI NUCLEAR POWER PLANT"

Samuel N. Irwin and Robert Kley, Holley Carburetor Company

An analog simulator with specially designed electromechanical equipment was developed to simulate one of the three loops of the Enrico Fermi Atomic Power Plant. Included in the simulation were all elements but the steam turbine, i.e., the reactor, intermediate heat exchanger, steam generator, mixing and transport delay phenomena, and steam system hydraulics.

With the support of a steady-state digital analysis of the plant, a philosophy of plant control was evolved. Conceptual hardware designs were tested on the simulator and an optimum design was selected.

Analysis determined the requirements of a training station to permit the simulator to be used as a plant operator training facility. Consoles containing electrical equivalents of the actual control hardware were constructed and interconnected to the computer.

"ANATRAN—FIRST STEP IN BREEDING THE DIGINALOG"

Lee Ohlinger, Northrop Corporation, Norair Division

A planned and controlled integration of digital and analog computers could be effected by industry if the final general purpose "diginalog" were produced in steps commensurate with the developing state of the art. The first step, described herein, is the development of an analog symbolic language and digital compiler by which the engineer can write his problems in quasi-mathematical and familiar language which the digital computer can then translate into a digital input function generation, a set of calculated pot settings, and a complete analog flow diagram. Subsequent steps in developing the diginalog are also described.

(Continued on page 39)

W. Herbert Hartman

Hugh W. Granberry

ELECTION NEWS

Professional Group on Broadcasting

W. Herbert Hartman, KCRA-TV, chairman. Hartman got an early start in the radio field, holding a first-class radiotelephone license at the age of 15 while still attending high school in San Antonio. At this time he was reputedly the youngest holder of this grade of license from the FCC.

In the years following he was employed by several of the San Antonio broadcast stations and eventually became chief engineer for the Gila Broadcasting Company in Arizona. In this state he designed and built several stations. In 1949 he became chief engineer for KCRA in Sacramento and in 1955, designed and built the present KCRA-TV facility.

He holds other memberships in the Society of Motion Picture and Television Engineers, and the Audio Engineering Society. He is one of the youngest members in the Broadcast Pioneers Club.

R. J. Newman, RCA, vice chairman.

Hugh W. Granberry, General Electric Company, secretary. Granberry, who is district sales manager for broadcast equipment is located in the Redwood City office of GE. He is a graduate of Texas Technological College at Lubbock, having a BSEE with high honors.

His professional career has been with General Electric Company since his graduation in 1941. He has been successively a test-course engineer; a test-shop engineer in the tube division; a transmitter design engineer; a broadcast television sales representative and district sales manager for broadcast equipment in Houston, Texas. He was transferred to the Redwood City office in January of 1960.

ELECTION NEWS

Among the Students

Recently, the Joint Student Branch AIEE/IRE at the University of California

(Continued on page 40)

MORE WJCC PROGRAM

SESSION VIA

Thursday, May 5
2:00 to 5:00 P.M.

PROGRAMMING SYSTEMS

Chairman: George H. Mealy, Rand Corporation

Panelists:
Robert L. Patrick, Manhattan Beach, California
Ascher Opler, Computer Usage, Inc.
Richard Ridgway, IBM Corporation

Programming systems, all but unheard of five years ago, have become as large and complex as the computers with which they are used. Their purpose is to facilitate communication between the programmer and the machine and to sequence and coordinate execution of object programs and components of the system. Their importance may be indicated by the fact that most computer users will not consider ordering a machine without a programming system.

Systems of the first variety may be called translators. These are typified by the various compilers for UNIVAC, the symbolic assembly programs for the IBM 650 and 709, SOAP and SAP, and algebraic translators such as FORTRAN. The second type of programming system is generally called a monitor, or operating, system. Although they started as relatively simple affairs intended to sequence jobs through the machine and make certain debugging aids available to the programmer, present operating systems, such as SOS, the SHARE operating system for the IBM 709, generally include several translators as subsystems, together with various input-output and debugging facilities.

System programmers are currently faced with three major problems: (1) How can we construct a single system (at least, from the point of view of the programmer using the system) that will operate on a variety of machines; (2) how can we construct subsystems that will coexist comfortably within the same operating system; and (3) how can we smooth the transition to the next machine, as concerns both the task of constructing the new programming system and re-educating users of the system?

"MAN-TO-MACHINE COMMUNICATION AND AUTOMATIC CODE TRANSLATION"

A. W. Holt, on leave from Remington Rand Univac to the Moore School of Electrical Engineering, and W. J. Turanski (deceased)

The ACT system is a programmed adjunct to a general purpose computing machine (currently considered for the MOBIDIC) whose purpose is to facilitate the initial encoding and subsequent application of specific code-to-code translation procedures. "Code-to-code translation" is primarily meant to cover the conversion of problem-oriented pseudo-codes into machine code equivalents. The ACT system provides for the "housing" of many distinct translation procedures—carrying algebraic, data-processing, simulation languages, etc.,

(Continued on page 40)

MORE WORDS

high-class editing, and a more finished production were the satisfactions of the former, although the pay was likely to be lower.

In closing, Olken announced that the next gathering of PGEWS would be on May 17. On June 14 there will be a joint meeting with the Engineering Management Group.

—Gertrude Taylor Smith

MORE WJCC PROGRAM

into any of a variety of computer codes—within the bounds of a single controlling system.

The ACT system consists of a number of components some of which have usefulness outside the system. Principal example is a general-purpose allocation interpreter which, for running programs, permits all storages (for code, internal storage, constants, external files, etc.) to be allocated as part of problem computation without greatly impeding computation speed. Such a facility is shown to be essential for construction of ACT.

Also associated with ACT is a writing convention called "canonical form" which governs the presentation of data (i.e., programs in source code submitted for translation). Canonical form, while flexible enough to permit highly diverse problem codes, standardizes all those signals which the basic ACT components decode.

"THE COMPUTER OPERATION LANGUAGE"

G. F. Ryckman, General Motors Corporation

The many machine-oriented and problem-oriented languages existing and being planned today give rise to more complex problems in operating a computer. The development of computer operating systems has materially aided the problem of getting a program or series of programs on and off the computer efficiently. The variety of language processors has created a new operating system function—that of interpreting a language describing the processing to be performed for a given job. In particular the language is used to call a given processor, prescribe pertinent options, and other control information. As such, it is termed a computer-operation language, or operator oriented language. Not only does this language free the human operator of many clerical tasks, it also provides for more consistent and error-free operation.

"A NEW APPROACH TO THE PROGRAMMING PROBLEM"

William Orchard-Hays, Corporation for Economic and Industrial Research, Inc.

The data processing field has become accustomed to major advances, change and reworking of systems in short time spans. Yet there is considerable confusion as to how to take full advantage of new equipment, and a growing uncertainty as to the practicability of current trends.

Several current efforts at designing "universal" languages—both problem-oriented and machine-oriented—seem to neglect the dynamic nature of the problem. Starting with a few basic premises about the nature of the problem of using EDP equipment, an approach to the design and utilization of partially self-organizing systems is discussed. At the heart of the problem is communication between people of various skills, only one of which is computer programming, and the effective use of the equipment to serve the needs of each. Communication with machines is the specialty of the programmer, but he serves the most useful function by making this facility available to others. To avoid inordinate programming and compatability problems, however, he needs systems which are self-adaptive in a machine-oriented sense but responsive to change in a problem-oriented sense. Only in this way can knowledgeable people be engineerd into, and not out of, the over-all projects with which they are concerned. Two by-products of such an approach are the ability to experiment with systems, as such, and alleviation of the programmer training problem.

MORE STUDENTS

elected officers. Professor H. J. Scott is faculty advisor for IRE.

New officers include: Joseph H. Wujek, Jr., chairman; Robert Arnold, vice chairman; Jerry Haney, treasurer; and George Steres, secretay.

SESSION VIB
Thursday, May 5
2:00 to 5:00 P.M.

INPUT-OUTPUT AND COMMUNICATIONS

Chairman: John A. McLaughlin, IBM Corporation

Panelists:
J. Svigals, IBM Corporation
G. Warfel, Bank of America

Although noteworthy progress has been made, input-output continues to be a major problem in many data processing systems. The development of new techniques for solving input-output problems is being emphasized.

The word "communications" is becoming more commonplace among computer engineers. On the one hand communications facilities are being used in data processing systems to couple computers to remote input-output equipment; on the other it has been determined that digital computer techniques are applicable to switching centers for complex message communication networks. Although most of the applications for data communications systems have been military, there is a growing trend toward communications in commercial data processing systems. In the future we can expect a stronger partnership between communications engineers and computer engineers, both in technology and in systems.

"A LINE-DRAWING PATTERN RECOGNIZER"

Leon D. Harmon, Bell Telephone Laboratories

A machine is described which recognizes line drawings of circles, triangles, squares, pentagons, and hexagons. This identification is independent of rotation and, within limits, of size, precision of drawing, or positioning. The system will distinguish and count separate objects up to six with limited independence of the size, shape and position of each.

This "Gestalt" recognition is accomplished by using a dilating circular scan. The virtue of such scanning is that object-size changes translate into time-of-arrival changes while object rotation preserves topological relationships. The n-gon detection depends on side counting, and the object counter uses the same logic in conjunction with a detection of discontinuities.

Thirty-two small photocells arrayed in a circle are mechanically puckered across the input plane. Light signals derived from opaque line-drawings are converted into binary representation in a special thyratron register. Time sequencing of logical operations and output displays is relay controlled. The actual decision logic uses a combination of optical and electronic devices.

It is also shown that this circular scan technique is applicable to automatic detection of letters and numbers over a wide variety of styles. Several examples are given.

"AUTOMATIC STORE AND FORWARD MESSAGE SWITCHING SYSTEM"

T. L. Genetta, H. P. Guerber, and A. S. Rettig, RCA

This paper will describe the system design of an automatic store and forward type message switching center and will review the implementation of the system requirements with modern computer techniques. The system is capable of receiving messages which are originated on paper tape, punched cards, magnetic tape and other digital media; controlling their distribution throughout a worldwide communication network consisting of voice frequency lines, microwave

(Continued on page 42)

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NEWS OF HAWAII

Microwave Trunking

Early in March the Hawaii Section scheduled a presentation by Edward C. Schoen covering the Hawaiian Telephone Company's microwave system which provides trunking for Kona. Schoen is a staff engineer with the company. Engineering aspects of special interest were to be covered, particularly including the use in this system of a double passive repeater with about 500-ft spacing between reflectors.

MORE WJCC PROGRAM

and radio links; and finally delivering the messages to their destination in suitable form for manual use or automatic processing on computers.

The first part of the paper will be concerned with identifying the problem, describing the techniques and reviewing the important advantages of this system. The essential functional characteristics of a message switching system will be established.

The second part will be concerned with a method for the implementation of a system designed to meet the requirements for an automatic message switching center. Emphasis will be placed on the capability and flexibility of the system.

"THE VIDEOGRAPH LABEL PRINTING SYSTEM DEVELOPED FOR TIME, INC."

B. H. Klyce, Time Incorporated, and J. J. Stone, A. B. Dick Company

System considerations point out the feasibility of using high-density master file tapes in the preparation of subscriber labels for magazines, thus eliminating the necessity of using the central computer complex for the preparation of edited tapes. The operation is completely automatic, and operators are required primarily to feed raw materials and file tapes into the machine and to remove the finished products. Production of labels at the rate of 131,000 per hour is accomplished by an electrostatic process in which the image is formed directly on a special paper. Several safety features ensure reliable operation of the equipment.

(END)

LOCAL FEATURE

Instrument-Automation

For the first time in its history, the Instrument Society of America will hold a combined conference and exhibit in San Francisco, May 9 through 12. Sessions will take place in the Civic Auditorium, while products will be on display across the street in Mole Hall.

Anticipated attendance is in the neighborhood of 5000. There will be about 25 sessions of 60-odd papers. One example of an IRE-member presentation is that of John W. Corcoran, Beckman & Whitley, San Carlos, titled, "Aerosol Distribution and Aerodynamic Breakup of Droplets."

Other sessions will be concerned with nuclear, metals & ceramics, measurement & control, analysis, feedback control, and aeronautical instrumentation. Other IRE participation will include that of member exhibitors.

RELIABILITY SEMINAR

Program

MORNING SESSION

Friday, May 6
9:30 A.M. to 12:15 P.M.

Introduction and Keynote Address

"POLICIES FOR RELIABILITY ORGANIZATION IN A MULTI-PRODUCT-DIVISION COMPANY"

J. M. Wuerth, Autonetics

Autonetics is the Operating Division of North American Aviation, Incorporated, which develops and manufactures advanced electronic and electro-mechanical systems and equipment for a wide variety of military and commercial applications. The total employment is more than 16,000.

For basic management considerations, Autonetics line activities have been divided into a series of product divisions, each of which is headed by a vice president and each of which contains its own engineering, quality control, manufacturing, purchasing and marketing, and administrative organizations.

Many Autonetics military-system-development programs involve the activities of two or more product divisions, and therefore the problem of providing a consistent and realistic approach to reliability policies and organizations presents many unique challenges to management.

This paper describes the management methods being used to establish, issue and implement reliability policies and procedures throughout the Autonetics Division, under the general policy guidance of an executive level reliability-policy board.

"SOME ECONOMIC CRITERIA FOR SELECTING A RELIABILITY POLICY"

R. P. Bosley, Raytheon

Management tolerates reliability organizations for a number of reasons. Not unimportant among the reasons are: (1) the customer insists on specific reliability programs, and (2) groups such as ours increase billings (or at least have that potential). We have a responsibility to change that toleration into justified support.

In looking at the value of a reliability function from a top management viewpoint, we have some things working for us which should be exploited, and some working against us which should be eliminated.

The following are to our advantage: (1) The higher the inherent reliability of equipment, the less money is spent in manufacturing for rework, retest, implementing changes, and performing 100% inspection. (2) The higher the reliability of equipment delivered, the better our company reputation becomes; with the long-range results that competitive position has room to improve, and that the customer may profitably spend more money for original equipment and les for maintenance. (3) Expensive programs in parts evaluation and the like under specific contracts have long-term effects and use. They aid the purchasing function and, in many cases, force the state-of-the-art upward. (4) Data generated through a reliability program is available nowhere else and can help management to understand and control overall operations by knowing where the most serious technical problems lie.

The following concepts in the minds of top management are to our disadvantage: (1) We are empire builders. (2) We raise estimates on proposals and thereby jeopardize our competitive position. (3) Management doesn't really understand or have confidence in our basic tools, i.e., statistics, design reviews, failure reporting, etc. (4) We keep talking about our tools (which are not fully understood) rather than providing accomplishments which others can talk about. (5) We have no measure of what a dollar's worth of reliability program will buy in terms of equipment reliability in use.

The problem at hand is to make use of our assets by putting dollar signs on them so they will be understood by management, and to eliminate our liabilities or convert them into assets through justification in terms of dollars.

This paper will be devoted to a discussion of the advantages and disadvantages outlined above with recommendations as to the methods of applying dollar figures to each.

"PRACTICES MAKE POLICIES"

Nathan Weiner and Harold D. Toy, Kollsman Instrument Corp.

Acceptance of the reliability group within the company structure is equivalent to espousing a philosophy of reliability and adopting formal policies with regard to reliability engineering.

Assuming that a competent and adequate staff has been recruited into reliability engineering, it is essential that the reliability group enjoy equivalent and independent status among the subdivisions such as sales, production, procurement, or field service. The association with other subdivisions should be democratic and cooperative. No policy should be instituted before those who are to be affected have had an opportunity to participate in its formation.

Whatever recommendations are developed by reliability engineering, their proper execution rests with the rest of the organization and so the innovations must be willingly accepted.

The paper shows that derivation of a reliability index based on a mathematical model of the equipment and the published curves of failure rate versus load and stress for electrical and mechanical components has to be amended to

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GRID RETURNS

Letter to the Editor

Dear Frank:

I was so pleased to receive the certificate from the San Francisco IRE Section, and the Editorial Board of the **Grid**. Would you please pass this letter on to Karl Spangenberg at the next meeting of your Editorial Board so that he can tell all of the members how much I appreciate their thoughtfulness.

I also want you to know that the things that I learned about editorial work from working on the **Grid** have not been wasted since this year I am the Editor of the IRE Transactions on Medical Electronics. Many of the things on editing have been of great help, and also a few of the pointers on how to get advertising have been of help.

With best wish to all of you.

Sincerely yours,
Lee B. Lusted, M.D.
Associate Professor of Radiology

Founding Publications Board Member Lusted refers to the certificate illustrated on the editorial page of the February issue. These have now been distributed to present and former staff and Board people.—Ed.

LOCAL FEATURE

The Marketing Side

A special program of potential interest to PGEWS and PGEM members and others with marketing responsibilities, will be held Wednesday evening, April 20, 8 p.m., at the Stanford University Physics Lecture Hall on Lomita Drive, Palo Alto. Titled "Profile of an Industrial Advertiser," the meeting will be open to all.

Sponsored jointly by the Peninsula Advertising Club and the Stanford Chapter of Alpha Delta Sigma, the program features a five-member panel from Beckman Instruments Inc., Fullerton. They will give individual talks, supplemented by slides, covering those aspects of industrial-advertising operations common to all advertisers regardless of size.

Each of the panel members will speak on a specific category: Mike York on "The Company"; Brice James on "What, Where, Why, and How Much"; Bill Gregory on "Public Relations, Publicity, Corporate-Image Advertising"; Bob Klees on "Advertising and Sales-Promotion Techniques"; George Gramlich on "Merchandising Techniques." A "Conclusion" by Mike York will be followed by a question-and-answer period.

In addition, Beckman Instruments, Inc., will display a selection of their advertising, merchandising, and sales promotion materials.

MORE RELIABILITY SEMINAR

include de-rating for design deficiency and for quality control deficiency. Since original indices would represent only that portion of the failures specifically attributable to components, failures caused by design and quality-control deficiencies should also be considered. A reliability index derived in this manner has been found to be consistent with field experience whereas the unmodified index was too optimistic.

Futility of relying on non-reliability personnel to perform reliability services or even to report adequately on field or factory failures is pointed out. The policy of assigning a reliability-engineering person where the need for one exists and the policy of minimizing the reporting demands on field-service personnel will be shown to have been instrumental in the establishment of data-collection channels to supply complete and adequate trouble and failure reports for processing.

LUNCHEON
MENU

CLAM CHOWDER
CRAB LOUIS SALAD
HOT ROLLS COFFEE
LEMON CHIFFON PIE

AFTERNOON SESSION

Friday, May 6
1:45 to 5:30 P.M.

"A GENERAL THEORY OF RELIABILITY"
T. R. Crowder

This paper develops a basic general theory of reliability which relates measurable parameters of components and of the environment to the expected performance of the system in that environment. The paper first defines a series of measurable quantitative indices of system performance or "operational reliability." It then develops analytical models of a completely generalized system and environment in terms of functions which can be developed in specific form for specific systems and environments from obtainable data using known analytical methods. It then develops expressions, in terms of the functions describing the models of system and environment, for estimating or predicting the value of the set of system operational reliability indices.

The general theory of operational reliability presented here constitutes a vehicle for the utilization of the type of information available about complex systems—in empirical or analytic form—in making realistic and meaningful estimates of system performance. The theory can also be used for the inverse purpose of specifying componnt and sub-system parameters, particularly reliability parameters, necessary to meet given meaningful performance requirements. It is believed that this basic theory represents a framework for the development of a consistent body of reliability theory which will have wide applicability.

"CRITERIA FOR SELECTION FROM AMONG VARIOUS POLICIES FOR RELIABILITY"
N. E. Golovin, NASA

The significant criteria for evaluating reliability policies are discussed with particular emphasis on the needs of NASA space research.

"MANAGEMENT POLICIES FOR ASSIGNING DEPARTMENTAL RELIABILITY RESPONSIBILITIES"
Dr. Leslie W. Ball (presented by John Hall, Dalmo Victor Co.)

The important management policies are discussed. A brief description of the status of reliability engineering along with the underlying causes of unreliability is given. A general reliability policy statement is made and more detailed policy statements including those dealing with purpose, organization, practices, personnel, and audit are presented.

The term "responsible skill groups" is introduced to apply to reliability-research engineers, reliability-management engineers, design engineers, design-assurance engineers, purchasing and manufacturing, and production assurance.

"FAILURE THEORY AS AN ACHILLES HEEL OF RELIABILITY POLICIES"
R. M. Bergslien, M. E. Goldberg, and G. T. Jacobi, Armour Research Foundation

The current dearth of usable failure data is traced to inadequate component-failure theories. An improved state of such theories is hypothesized, and the resultant effect on reliability policies examined. Avenues of approach to better understanding and to more useful failure models are suggested.

"WHY A CONTRACTUAL DOCUMENT MAXIMIZES THE PROBABILITY OF OBTAINING RELIABLE COMPONENTS"
B. L. Amstadter, Rheem Semiconductor Corp.

Concerning components, there are three major functional reliability responsibilities: (1) specifying reliability; (2) procuring reliability; and (3) producing reliability. All three of these responsibilities ultimately depend upon management policies, while the third at first appears to be the responsibility of the producing organization. However, the policies of the producing organization management, to a large extent, are influenced by the desires of the customer. Hence, they cannot be considered to be independnt of the consumer organization policies, but are inherently bound to it by the nature of the consumer-producer relationship.

Whether components will meet the ultimate requirements and conditions to which they will be subjected is truly dependent upon the purchasing policies and actions of the using management. Unless a firm, positive stand is taken, the end result will of necessity be a less-reliable product.

Consumer management must establish the basic policy that the procurement of reliable components is a prime management objective and that full and complete conditions, with respect not only to quantity and delivery, but particularly to all quality and reliability requirements, be included in the procurement document.

This requirement for full and complete reliability specifications has a far greater impact than appears at a cursory glance. It implies the actual knowledge on the user's part of these reliability requirements. However, the reliability requirements are not as well known as management likes to think. The fact is that engineering often does not know the actual operating conditions of the components. By focusing attention on contractual requirements for reliability, management is made cognizant of the problems pertaining to determining these requirements. Only then does management get a true picture of the scope of the over-all reliability program.

DINNER
MENU

FRESH PINEAPPLE CUP AU MENTHE
CAESAR SALAD
PRIME RIB OF BEEF AU JUS
or
ROCK LOBSTER TAIL, DRAWN BUTTER
BAKED POTATO MIXED VEGETABLES
DINNER ROLLS COFFEE
ASSORTED FRENCH PASTRIES

MORNING SESSION

Saturday, May 7
9:00 to 10:30 A.M.

Debate: Tentative Subject: "Should there be a Reliability Organization or is Reliability Everybody's Business."

INTERMISSION

10:45 to 12:15 P.M.

Debate: Tentative Subject: "Comparison of Policies—Component Development or Redundant Design."

Electronics in the Bay Area

Alameda
- Allied Nucleonics

Belmont
- California Technical Industries
- Dalmo Victor Company
- Western Gold and Platinum Co.

Berkeley
- Anamet Laboratories
- Advanced Instrument Corp.
- Berkeley Custom Electronics
- Berkeley/Dynamics
- Berkeley Sound Laboratory
- Hallikainen Instruments
- Lloyd Enterprises
- Microchemical Specialties Co.
- Scientific Engineering Laboratory
- Tinsley Laboratories Inc.
- University of California

Burlingame
- Bauer Electronics Corp.
- Broadview Research & Development

Concord
- Donner Scientific Co.
- Systron Corp.

Daly City
- Oliver Electronics Co.

El Cerrito
- Sieler Design Products

Emeryville
- Bennett Lobs. Inc.
- Fisher-Berkeley Co.

Hayward
- Engineered Instruments Inc.

Lafayette
- Pedersen Electronics

Livermore
- Coast Mfg. & Supply Co.
- Lawrence Radiation Laboratory
- Precision Technology Inc.
- Sandia Corporation

Los Altos
- Aero Electronics Co.
- Air Research and Development Command
- Consolidated Electrodynamics
- Meadows Terminal Boards

Los Gatos
- Belleville Hexem Corp.
- Cadre Industries Corp.
- Cycle Equipment Co.
- Halax Corp.
- Lewis and Kaufman Electronics Corp.

Menlo Park
- Barrett Electronics Corp.
- Harworth Mfg. Co.
- Jobbins Electronics
- James F. Lee
- Philco Corp.—Sierra Electronics Corp. Div.
- Stanford Research Institute
- Thermo Materials Inc.

Mountain View
- Advanced Technology Laboratories
- American Standard Atomic Energy Division
- Arrow Development Co., Inc.
- Exactel Instrument Co.
- Fairchild Semiconductor Corp.
- O'Dell Brothers
- Rheem Semiconductor Corp.
- Royco Instruments, Inc.
- Sylvania Electric Products

Napa
- Telebeam Industries

Oakland
- Alto Instrument Company
- Chattin Engineering Associates
- E-H Research Laboratories, Inc.
- Eldorado Electronics Co.
- Electro-Capacitors Co.
- Gilliland Instrument Co.
- Girard-Hopkins
- Knopp, Inc.
- Laboratory for Science
- Lake Manufacturing Co.
- Marchant Calculators Inc.
- Pacific Instrument Co.
- Sargent Royment Co.
- Tru-Beam Products Inc.
- E. R. Vinson Co.
- X-Tron Electronics Inc.

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- Admiral Corp.
- Alfred Electronics
- Allen Mfg. Co.
- Alpar Mfg. Corp.
- Alto Fonic Corp.
- Alto Scientific Co.
- Applied Technology Inc.
- Birdsell Mfg. Co.
- Brocker Labs.
- Components For Research, Inc.
- Corbin-Farnsworth Inc.
- Dymec Div. Hewlett-Packard Co.
- Ferro-Magnetics Co.
- Fisher Research Lab
- G.E. Computer Laboratory
- G.E. Microwave Laboratory
- General Dynamics Corp. Computer Laboratory
- Granger Associates
- Hewlett-Packard Co.
- Iconix Inc.
- ITT Components Div.
- ITT Farnsworth Div.
- ITT Laboratories
- Johnson-Williams, Inc.
- Kaar Engineering Corp.
- Kaiser Aircraft and Electronics
- Kearfott Co. Inc.
- Knapic Electro-Physics Inc.
- Levinthal Electronic Products (Radiation, Inc.)
- Link Aviation Div. General Precision Inc.
- Melabs
- Menlo Park Engineering Co.
- Microwave Electronics Corp.
- Pacific Electro-Magnetics Co.
- Palo Alto Engineering Co. Div. Hewlett-Packard Co.
- Palomar Scientific Corp.
- Pearson Electronics
- PEK Laboratories, Inc.
- Philco Western Development Laboratories
- Printronics Corp.
- R-S Electronics Corp.
- Radiation Detection Co.
- Schmidt Engineering Co.
- Shockley Transistor Corp.
- Spinco Div, Beckman Instruments
- Thor Transformer & Electronics
- Tub-Lok Mfg. Co.
- Turner Associates
- Ultek Corp.
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- Varian Associates
- Vega Electronics
- Watkins-Johnson
- Western Pacific Transformer
- Wiancko Engineering Co.
- Wiltron Company

Redwood City
- Ampex Corp.
- Carad Corp.
- Detroit Controls
- Farinon Electric Co.
- K-F Development Co.
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- Monte Verde Industries
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- Zenith Radio Research Corp.

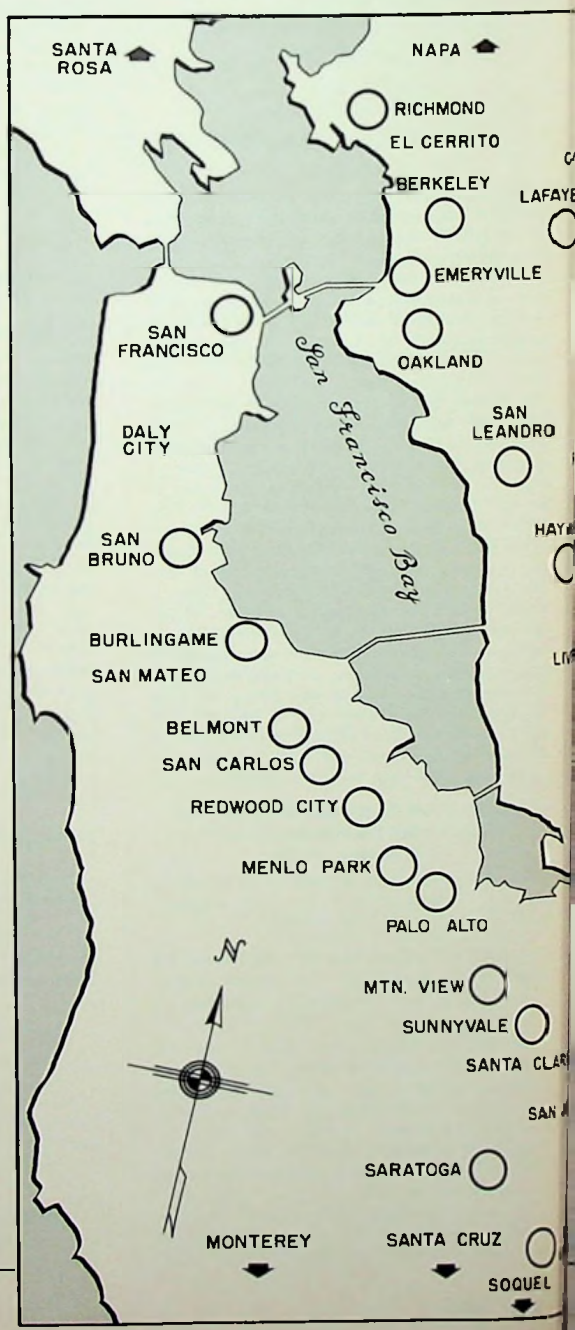
Richmond
- Advanced Instrument Corp.
- Berkeley Div, Beckman Instruments
- Ramage & Miller Inc.

Systems Div, Beckman Instru
Tracerlab, Inc.

San Bruno
- Allied Electronic Equipment C
- Electronics of No. Calif.
- West Coast Enterprises

San Carlos
- Beckman & Whitley, Inc.
- Dolmatron Co.
- Eitel-McCullough, Inc.
- Insul-8-Corp.
- Lenkurt Electric Co.
- Litton Industries, Power Tube
- Precision Instruments Co.
- Toro Industries, Inc.

San Francisco
- Atlas Electric & Eng. Co.
- Bay-Mar Electric Eyes
- Robert Dollar Co.
- Electrical Communications, I



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Erickson Products Co.
Etching Co. of Calif.
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Remler Co.
Scala Radio Co.
Secode Corp.
Watts Enterprises
Whiteford Laboratory
Yuba Consolidated Industries

San Jose
Anthony Machine & Engineering Co.
Coswell Electronics Corp.
Food Machinery & Chemical Corp.
G.E. Atomic Power Equipment Dept.
G.E. Control and Instrumentation Section
General Dynamics Corp. Atomic Power Equipment
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Ultronix Inc.

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Aero-Victor Co.
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Pulse Engineering Inc.

Santa Cruz
California Tube Lab

Santa Rosa
Santa Rosa Electronics Co.

Saratoga
Pick Labs
Saratoga Scientific

Soquel
Stewart Engineering Co.

South San Francisco
Applied Electronics Co., Inc.

Stanford
Stanford Electronics Laboratory
Stanford Microwave Laboratory

Sunnyvale
Ampex Audio, Inc.
Gudeman Co. of Calif.
Huggins Laboratories Inc.
Hundley Engineering
Illumitronic Engineering Co.
Lockheed Aircraft Corp.
Sperry Gyroscope Co.

Walnut Creek
Applied Radiation Corp.

Rheem executives and department heads ready to file into their new facility at Mountain View: M. W. Barnard, assistant manager, manufacturing; Donald D. Miller, manager, administration; S. Wiesner, manager, quality control; P. A. Araquistain, manager, finance; Daniel Miller, manager, manufacturing; D. F. Brower, manager, engineering; L. B. Valdez, manager, research and development; J. D. Hurley, manager, marketing; H. Marchman, vice president, operations; and E. M. Baldwin, vice president and general manager

GRID SWINGS

It Is Reported:

Alto Scientific Company has announced the formation of two new divisions: subsystems and components. The new subsystems division will be primarily engaged in subcontract work covering two principal areas—console checkout equipment and "black box" design and manufacture. Manager of the new division is **K. A. McQueeney.** The components division, managed by **J. F. Melton,** covers the design and manufacture of various electronic components, including uhf f-m receivers and associated products, solid state devices, special r-f bandpass filters and various types of generators.

Rheem Semiconductor Corporation has opened its new $2 million, 100,000-sq-ft semiconductor plant in Mountain View. The one-story structure of glass brick and concrete is on a 20-acre tract to permit future expansion as required. The company will continue to use two other plant buildings for research and production in transistors, diodes and other semiconductor devices. The new plant is equipped with 700 tons of air conditioning, positive interior air pressures, and a filter system for dust-free interior climate control necessary for high-quality semiconductor production. The company now employs 350 persons and plans to employ more than 1,000 by the end of 1960.

A new division for engineering and manufacturing microwave instruments, signal generators and waveguide devices has been formed by the **Hewlett-Packard Company. Bruce Wholey** has been named general manager of the new division. Wholey has been with Hewlett-Packard for 15 years, and was formerly manager of an engineering

(Continued on page 49)

Radiation Ridge, site of antenna-pattern range in construction by Dalmo Victor Co. Terrain, in the Montara mountains behind Half Moon Bay, features 500-ft drop from line of sight to valley below

Poulter

Eding

MORE SWINGS

development division of the firm. **Dr. Howard Poulter** will be engineering manager for product development and **Gordon Eding** has been made plant manager for the new division, which will be located in the new Hewlett-Packard facility in Stanford Industrial Park, Palo Alto.

Three new engineering research groups have been established by **Stanford Research Institute:** a graphic sciences laboratory under **Virgil P. Barta,** an applied physics laboratory headed by **Dr. Charles A. Rosen,** and a mathematical physics group managed by **Dr. Carson Flammer.**

Barta's group is emphasizing the use of electronic techniques in such applications as pressureless printing, color separation scanners, instrumentation and printing process control. His staff includes video system specialists who are concerned with research in visual communications engineering. The Applied Physics Laboratory is engaged in several research activities involving physics and engineering. Major efforts are in electron-beam machining, field emission and self-organizing machines. Flammer's group is concerned with the following research fields: plasma and electron physics, solid state physics, electromagnetic theory, and special functions of mathematical physics.

A licensing agreement between **Eitel-McCullough, Inc.,** San Carlos, and **English Electric Valve Company** of Chelmsford, England, has been arranged for the exchange of manufacturing rights and technical information. The agreement will potentially expand the product lines of the two electron-tube companies in negative-grid tubes, klystrons, and traveling-wave tubes. For Eimac it marks the first licensing agreement with a foreign company. The agreement permits each company to manufacture the other's products and market them internationally.

Lawrence (Larry) Weiland has joined **Ampex Professional Products Company** as staff assistant to **Charles Ginsburg,** manager of video engineering. Weiland

(Continued on page 50)

MORE SWINGS

has been manager of advanced planning for engineering at the National Broadcasting Company, New York. Weiland will become manager of video engineering on June 1, at which time Ginsburg will become manager of advanced video development.

Upon graduation from Columbia University in 1948, with a degree in electrical engineering, Weiland joined the engineering training program at NBC. He served in equipment maintenance, design engineering and development laboratory assignments before assuming his recent responsibilities with the network.

William J. Fleig, former director of product development and engineering manager for Huggins Laboratories, Inc., has joined **Microwave Electronics Corporation** as senior engineer. A graduate in electrical engineering from the University of Michigan, he was a laboratory instructor in electron devices there and a graduate research assistant in the University's tube laboratory. Earlier, Fleig worked in the fields of microwave relay and high-frequency carrier-communication systems at Bell Telephone Laboratories and another period with Sperry Gyroscope Co., Great Neck, Long Island, doing quality control work on sub-miniature vacuum tubes used in air-to-air missiles.

Fleig

Bach

Robert J. Bach has been named sales application engineer for **Alfred Electronics,** Palo Alto. Bach goes to Alfred from Hewlett-Packard Co., where he had been an instrument sales engineer in that firm's marketing department since 1958.

Prior to 1958, Bach was a member of the Army Rocket and Guided Missile team, Redstone Arsenal, and was assigned as resident ordnance engineer for the Nike missile guidance package at Western Electric in Winston-Salem, N.C.

Bach's experience also includes four years as project engineer with the Navy Department, Bureau of Ships, in the Electronics Division of the Air Navigational Aids Section. He received his BSEE degree from Marquette University in 1951.

Beall *Hansen*

Formation of **Tech-Ser, Inc.**, electronic engineering sales representatives, is announced by **Jack C. Guy**, president. The new organization is made up of former employees of the Gerald B. Miller Co. which recently resigned its representative activities.

Tech-Ser, Inc. will operate in California and Arizona with headquarters at 3540 Wilshire Boulevard, Los Angeles, and with branch offices in San Diego and at 640 Donohoe Street, East Palo Alto.

The local office is staffed by **Ralph W. Beall, Howard M. Hansen,** and **Mrs. Gloria Wright.** Continuity of service to customers and manufacturers is being maintained by the new firm.

Recent personnel additions to the staff of **Long & Associates,** manufacturers' representatives, Redwood City, include **Paul Potter,** sales engineer, and **Miss Aimee Anderson,** office manager. Potter, a graduate engineer from San Jose State, previously was associated with Ampex Corp., Philco Western Development Laboratories and Sperry.

In the electronic defense laboratories of **Sylvania Electric Products, Robert R. Fossum** has been appointed to head the signal analysis section and **Toivo H. Koski** to head the control devices section.

Fossum was formerly a mathematician at the Lincoln Laboratory in Lexington, Mass. He joined Sylvania in 1957. Koski, formerly an engineer-in-charge, joined Sylvania in 1956 and was associated with the California Research and Development Company and with the University of California Radiation Laboratory.

Fossum *Koski*

EVENTS OF INTEREST

Meetings Summary

May 2-4 — **National Aeronautical Electronics Conference.** Biltmore and Miami Hotels, Dayton, Ohio. Walter Melnick, 1923 Mattis Dr., Dayton 39, Ohio.

May 2-5—**URSI-IRE Spring Meeting.** Sheraton Hotel, Washington, D. C. Mrs. Helen E. Hart, URSI USA Nat'l Comm., 2101 Constitution Avenue, Washington 25, D. C.

May 9-11—**PGMTT National Symposium.** Hotel Del Coronado, San Diego, Calif. Dr. David Medved, 3628 Poe Street, San Diego, Calif.

May 10-12 — **Electronic Components Symposium.** Hotel Washington, Washington, D. C. Gilbert Devey, Sprague Electric Co., North Adams, Mass.

May 23-25 — **National Telemetering Conference,** Miramar Hotel, Santa Monica, Calif.

Papers Calls

May 1—100-200 word abstracts for the 1960 Western Electronic Show and Convention (August 23-26). Send to: Chairman of the Technical Program, Richard G. Leitner, WESCON Business Office, 1435 South La Cienega Blvd., Los Angeles 35, Calif.

May 16—Abstracts of not more than 800 words for the Seventh National Symposium on Reliability and Quality Control (Jan. 9-11, 1961) sponsored by IRE, the AIEE and the ASQC. Send to: R. E. Kuehn, IBM Owego, Owego, New York.

June 6 — 500-word abstract for unclassified sessions of the Seventh East Coast Conference on Aeronautical and Navigational Electronics (October 24-26; Baltimore, Md.) Send to: Sanford Hershfield, Mail No. G-3143, the Martin Company, Baltimore 3, Md.

June 15 — Abstracts for the Twelfth Annual MAECON conference (November 15-16; Kansas City, Mo.) James Austin, General Papers Chairman, Bendix Aviation Corp., 95th & Troost, Kansas City, Mo.

THE SECTION

Membership Status

Following are the names of IRE members who have recently entered our area, thereby becoming members of the San Francisco Section:

Woody L. Archer
Joe E. Armstrong
Rahmat A. Aziz
Bruno D. Benassai
Willis E. Bergfield
Robert L. Bondurant
Robert A. Boudrias, Jr.
Morton Bradski
Clyde A. Bruce
Vinton D. Carver
Rudolf E. Chope
Donald W. Commons
Richard S. Darling
William H. Davidow
Leonard H. Davids
Victor J. Declarco, Jr.
Robert A. De Forest
James C. Dehring
William C. Doyle
James V. Dunn
Martha Evans
Edward J. Fraser
Ephraim H. Frei
Robert E. Gang
Albert R. Giddis
Ralph W. Goble
Edward H. Grace, Jr.
David A. Graham
Hugh W. Granberry
Harvey Hall
James D. Havens
William Hershyn
Richard L. Hoffer
Richard W. Johnson
Robert C. Jones
Raymond Justice
Kwan H. Kang
Denis E. Killen
Thomas I. Kirkpatrick
Joseph Klimberg
Fred Lee
Daniel Lloyd
Robert F. Mager
Donald M. Mawdsley
Robert E. Metz
Noel B. Montagnon
Aron I. Murai
John B. O'Toole
Robert M. Pailthorp
David B. Park
William E. Peck
Charles E. Phillips
Harry B. Quarfoot
Heinz J. Ratsch
Ronald A. Rohrer
George E. Sage
Jerry M. Sakai
Chiao-Lian Saw
Ronald M. Schaffert
Paul H. Schottler
Vernon B. Slinker
Jack Star
Byron E. Swartz
Lloyd E. Swedlund
Michael C. Swiontek
Richard B. Van Gelder
Cortland L. Watson
Frank K. B. Wheeler
Charles H. Wirth
Theodore E. Yeager

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

Thomas H. Bugbee
Robert A. Burco
William F. Colescott
Thomas M. Dodington
James C. Donald, Jr.
Erasmus Dyura
Gerald D. Ewing
George D. Ferguson
Ronald B. Flippin
Tor Hagfors
Gordon A. Hammers
James W. Hansen
John V. Helmann
John E. Kallander
Donald C. Mead
Grace M. Pacak
Thomas R. Parkhill
Jerry K. Parks
Alfred L. Peterson
Harry R. Roberts
Elmer S. Seeley
Seth A. Shepard
Jerome Spector
Carl D. Waddle
E. Dean Waring
Ira Weissman
William J. Welch
Al M. Wilson
Merrill D. Wittman

Following are the names of members who have recently been transferred to a higher grade of membership as noted:

SENIOR MEMBER

Charles Antony
Jack C. Baker
C. Bruce Clark
Leo Freiberg
Frank K. Inami

MEMBER

Weston A. Anderson
Everett F. Basham
Stephen E. Bederka
Paul J. Beneteou
Frank D. Brandt
Anatole A. Bulow
Robert J. Butwell
Earl D. Cotterel
Richard W. Cummings
David K. Dean
Robert L. Dudley
John N. Dukes
Theodore D. Geiszler
Arthur Gill
Q. Marion Hansen, Jr.
Kenneth J. Harker
Garth Hess
Ronald C. Higby
John R. Hulme
Brian D. King
Jack M. Knudson
Fred Kurzweil, Jr.
Charles M. Lequieu
Charles G. Le Vezu
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Don G. Middlebrook
Owen E. Pallakoff
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Svein B. Rasmussen
John H. Rau
Jerome A. Rosenthal
Harold S. Rothman
Jack G. Salvador
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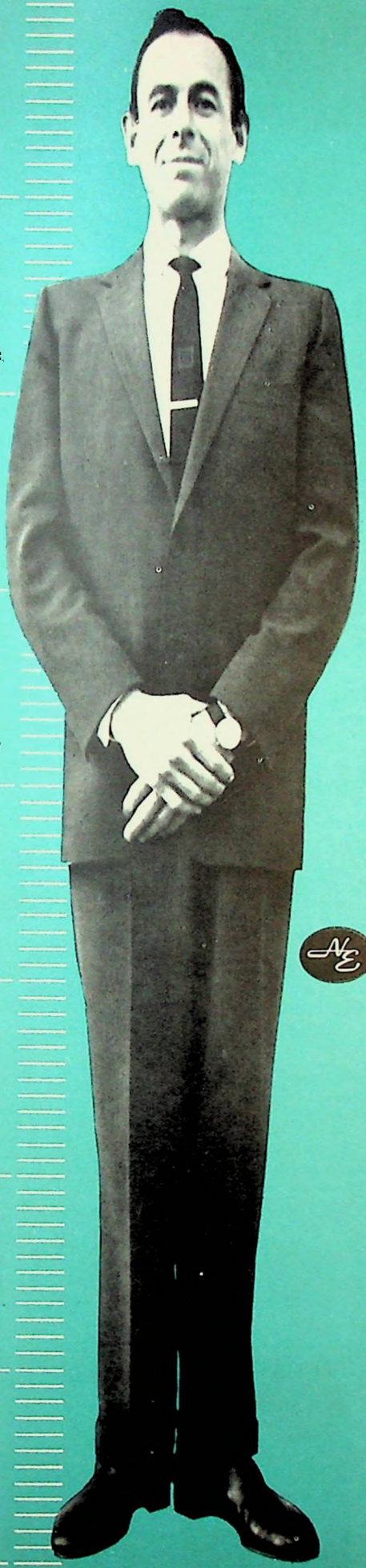
Richard N. Silvis
Vernon B. Slinker
Francis A. Spelman
Karl E. Sterne
Boyd L. Stratton
James M. Taylor
Marvin K. Van Gelder
Robert H. Wardwell, Jr.
Marvin B. Wittry

ASSOCIATE

Richard D. Meehan
Clarence Y. Okamura



Strain Gages,
BALDWIN-LIMA-HAMILTON
Waltham, Massachusetts

IOMAC LABORATORIES, INC.
Beverly, Massachusetts

dy
DYMEC
Division of
Hewlett-Packard Co.,
Palo Alto, California

hp
EWLETT-PACKARD COMPANY
Palo Alto, California

KIN TEL
KIN TEL
San Diego, California

F. L.
MOSELEY
CO.
Pasadena, California

SANBORN COMPANY
Waltham, Massachusetts

VARIAN ASSOCIATES
Palo Alto, California

feeling eight feet tall!

F. L. Moseley Co.
now represented by Neely

A key factor in Neely's position as the nation's largest electronic manufacturers representative firm has been its growth with the leaders among electronic manufacturers.

Now the F. L. Moseley Co. of Pasadena, California, has appointed Neely Enterprises to represent them in the four-state area of California, Arizona, Nevada and New Mexico.

Neely's factory-trained Field Engineers will represent Moseley's Autograf line of X-Y Graphic Recorders, Strip Chart Recorders, Logarithmic Amplifiers, Millivoltmeters, Data Handling Devices and Computer Accessories, giving complete service from their eight offices and six factory-authorized service departments.

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PHOENIX
641 E. Missouri Ave.
Phone: CR 4-5431
TWX: PX 483

TUCSON
232 S. Tucson Blvd.
Phone: MA 3-2564
TWX: TS 5981

MANUFACTURERS INDEX

Manufacturer	Representative
Ace Engineering & Mch. Co.	Premmco, Inc.
Accurate Instrument Co.	Jay Stone & Assoc.
Acton Laboratories	White and Co.
Alfred Electronics	White and Company
Airflow Company	Premmco, Inc.
Ameray-Nuclear Shielding Prod. Div.	White & Co.
American Mach. & Fdry.	McCarthy Assoc.
Analab Instrument Corp.	V. T. Rupp Co.
Antlab, Inc.	Jay Stone & Assoc.
Baldwin-Lima-Hamilton Corp.	Neely Ent.
Beckman/Berkeley Division	V. T. Rupp Co.
Behlman Engineering Co.	T. Louis Snitzer Co.
Bogart Microwave	Jay Stone & Assoc.
Bomac Laboratories, Inc.	Neely Ent.
Boonton Electronic Products, Inc.	O'Halloran Assoc.
Callite-Tungsten Corp.	Jack Kaufman
Data Instr., Tele	T. Louis Snitzer Co.
Daytronic Corp.	McCarthy Associates
Di/An Controls, Inc.	Jay Stone & Assoc.
Dymec, Div. Hewlett-Packard Co.	Neely Ent.
Electro-Pulse, Inc.	T. Louis Snitzer Co.
Electro Switch Corp.	Jack Kaufman
Electronic Associates	O'Halloran Assoc.
Electronic Measurements Co.	O'Halloran Assoc.
Electronic Mechanics Inc.	Jack Kaufman
Emerson & Cuming	McCarthy Assoc.
EMI-Electronics, Ltd.	White & Company
Empire Devices Products	White and Company
ERA Engineering, Inc.	Premmco, Inc.
Fifth Dimension, Inc.	Jay Stone & Assoc.
John Fluke Mfg. Co.	McCarthy Assoc.
Franklin Electronics, Inc.	T. Louis Snitzer Co.
General Communication	T. Louis Snitzer Co.
Glass-Tite Industries	Jay Stone & Assoc.
Hewlett-Packard Company	Neely Enterprises
Heli-Coil Corp.	Premmco, Inc.
Houston Instrument Corp.	McCarthy Associates
Hughes Products Co.	McCarthy Assoc.
Kauke and Co., Inc.	Jay Stone & Assoc.
Keithley Instruments	T. Louis Snitzer Co.
Kepco, Inc.	V. T. Rupp Co.
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Lindsay Structures	Premmco, Inc.
Manson Laboratories, Inc.	White and Co.
Massa Div., Cohu Electronics	McCarthy Assoc.
Menlo Park Engineering	O'Halloran Assoc.
Microwave Electronics Corp.	Jay Stone & Assoc.
Millivac Instrument Div., Cohu	McCarthy Assoc.
Narda Microwave Corp.	O'Halloran Assoc.
Oregon Electronic Mfg.	White and Company
Polarad Electronics	T. Louis Snitzer Co.
Radiation Counter Labs	White and Company
Sanborn Company	Neely Enterprises
Sensitive Research Instrument	McCarthy Assoc.
Sierra Electronic Corp.	T. Louis Snitzer Co.
Sorensen & Co.	McCarthy Assoc.
Telonic Industries	T. Louis Snitzer Co.
Ultrasonic Corp. of America	Premmco, Inc.
Varian Associates	Neely Enterprises
Wayne Kerr Corp.	McCarthy Associates
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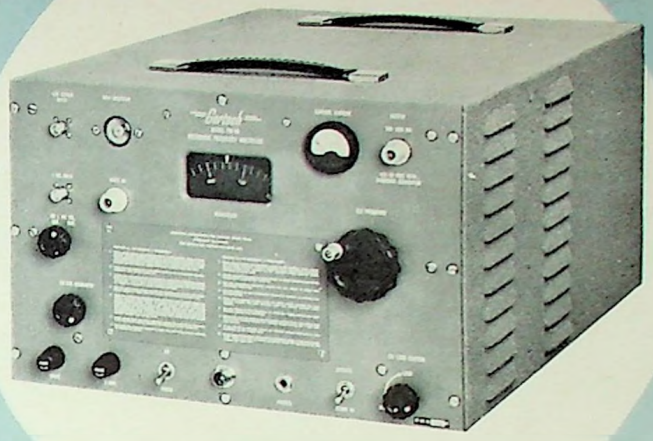
Wincharger Corp. (Zenith Radio Corp.)	Premmco, Inc.

INDEX TO ADVERTISERS

Gertsch

MICROWAVE FREQUENCY MULTIPLIER



MODEL FM-4A

-measures 100 to 30,000mc
-generates 500 to 30,000mc
with high accuracy and stability

This instrument transfers the accuracy and stability of a VHF driver into the microwave region. The unique Gertsch circuitry – a phase-locked UHF oscillator coupled to a buffer amplifier and harmonic generator-mixer – gives continuous and complete coverage throughout the region.

You can drive the unit with Gertsch frequency meters FM-3, FM-6, or FM-7. Accuracy and stability remain the same as that of the driving source. Fundamental frequency range is 500 to 1000 Mcs, with output to at least 30,000 Mcs available from external harmonic generator-mixer.

Instrument is ideal for calibration of cavity wavemeters... for precise measurements, or as an ultra-stable frequency source for microwave spectroscopy. Unitized construction simplifies servicing. Unit is adaptable for rack mounting.

Complete data in Bulletin FM-4A.

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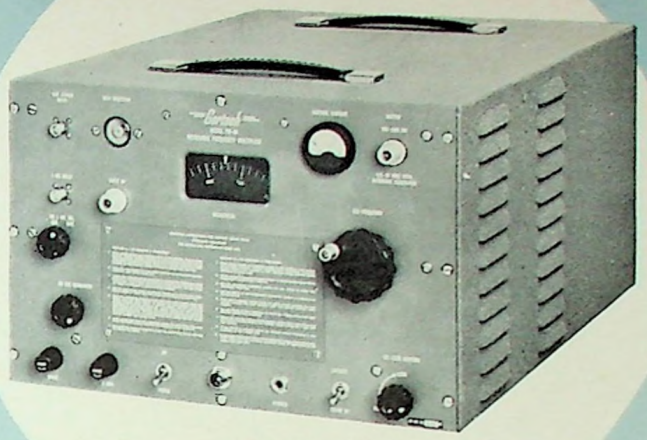

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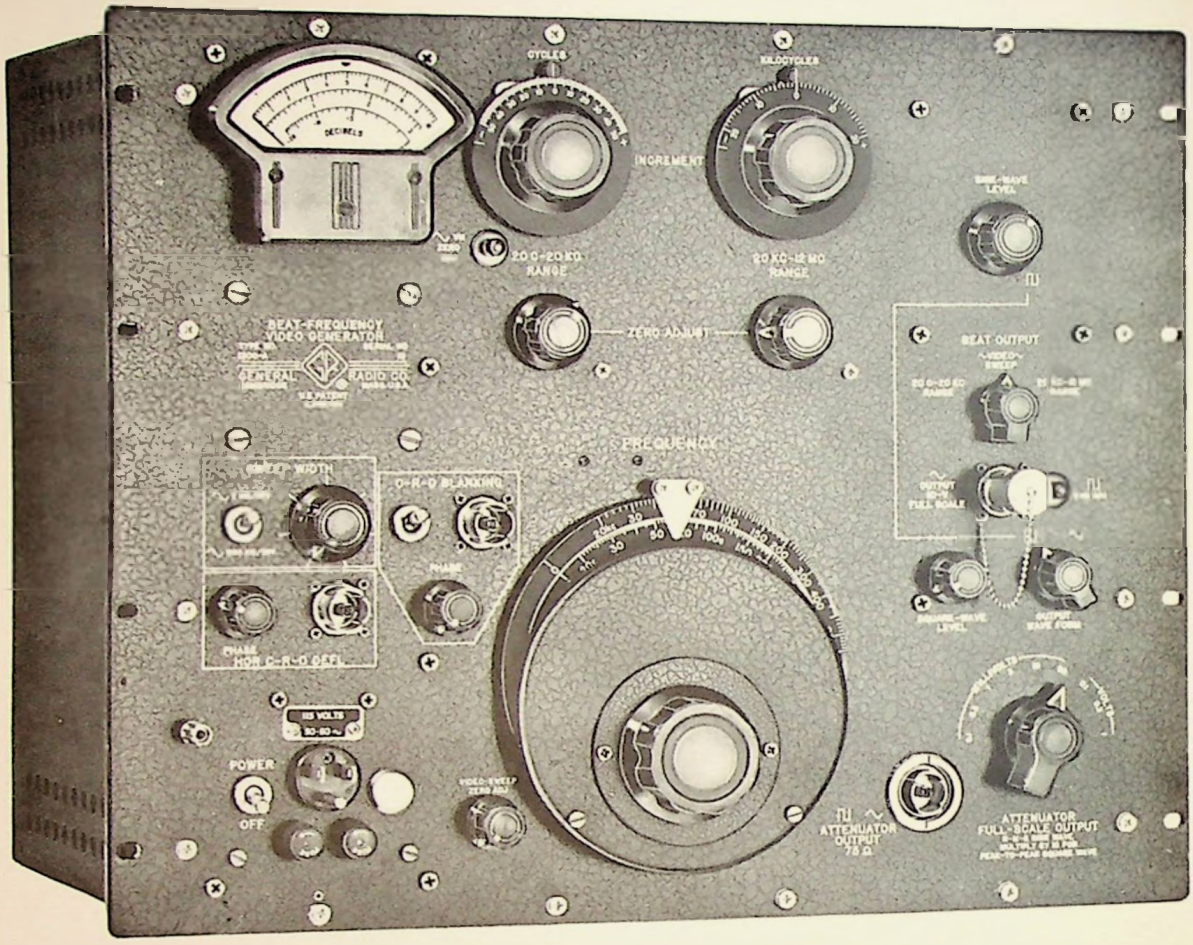
NEW 20c to 12-Mc Beat-Frequency Generator

for Sine/Square-Wave and Sweep Applications



The features of beat-frequency generators, so well liked for audio-frequency testing, are now available for ultrasonic and video-frequency work. Features include: complete audio- or video-band coverage in one sweep of the dial without annoying range switching . . . high resolution provided by incremental frequency dials for accurate point-by-point studies of amplitude peaks and dips . . . continuously adjustable electronic sweep for video measurements at center frequencies to 12 Mc . . . automatic graphic-level and x-y recording with accessory G-R Dial Drives . . . square-wave output for frequency-response testing by transient techniques (e.g., rise-time and ramp-off measurements) . . . adjustable ± 6-Mc sweep at center frequencies from 36 to 42 Mc (obtained directly from internal oscillators) for television i-f testing.

This instrument's many outputs and different modes of operation, coupled with excellent frequency stability and high output (10v) over the entire frequency range, make it the most versatile audio-video test instrument commercially available.

Write for Complete Information

Type 1300-A Beat-Frequency Video Generator . . . $1950.

As Manually-Tuned Generator:
Sine Wave: 20c to 12 Mc
Square Wave: 20c to 2 Mc

As Sweep Generator (60c sweep rate):
Sine Wave: 20 kc to 12 Mc
Sweep width is continuously adjustable from 0 to ±6 Mc at any center frequency from 0 to 12 Mc.
Horizontal deflection voltage and blanking pulse provided for scopes.

Calibration Accuracy:
20c to 20 kc, ±(1% + 1c)
20 kc to 500 kc, ±(2% + 1 kc)
500 kc to 12 Mc, ±(1% + 1 kc)

In addition to the main frequency dial, two increment dials calibrated from −50c to +50c, and −20 kc to +20 kc, are provided. Calibration accuracies are ±1c and ±0.5 kc, respectively.

Sine Wave — harmonic distortion
20c to 20 kc: < 1.5% of output
20 kc to 12 Mc: < 4% of output

Square Wave
Rise time less than 0.075 μsec above 300 kc
Top flat to 2% of peak-to-peak at 60c, 5% at 20c

Hum: less than 0.1% of output

	Voltage Range		Accuracy	Frequency Characteristic	Output Impedance
	Sine-Wave (rms)	Square-Wave (peak-to-peak)			
Attenuator output	0.1, 0.3, 1, 3, 10, and 30 mv; 0.1, 0.3, and 1v full scale, open circuit	1, 3, 10, 30, 100, and 300 mv; 1, 3, and 10v	±3% of full scale; attenuator db increments ±1%	flat within ±0.25 db from 40c to 20 kc (±0.75 db at 20c); ±1 db from 20 kc to 12 Mc	75Ω ± 2%
High output	0 to 10v	0 to 10v	±3% of full scale	flat within ±0.25 db from 20c to 20 kc; ±1 db from 20 kc to 12 Mc (open circuit)	820Ω ± 2%

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