

EDITOR'S PROFILE of this issue

from a historical perspective ...

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

September, 1967:

Cover: We get a listing and contact information for the Section and chapter officers for 1967.



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

[https://ethw.org/IEEE San Francisco Bay Area Council History](https://ethw.org/IEEE_San_Francisco_Bay_Area_Council_History)

At time of scanning, the bound volumes are held by Paul Wesling. July, 2021 Contact p.wesling@ieee.org

IEEE
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SEPTEMBER 1967

SAN FRANCISCO SECTION • THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.

ANNUAL DIRECTORY ISSUE

meeting reminder

Aerospace & Electronic Systems, Thursday, September 28
Communication Technology, Tuesday, September 19
Computer, Tuesday, September 26
Engineering in Medicine & Biology, Tuesday, September 19
Microwave Theory & Techniques, Wednesday, September 20
Monterey Student Branch/SCVSS, Saturday, September 23
Santa Clara Valley Subsection/Monterey St. Br., Saturday,
September 23
Systems Science & Cybernetics, Monday, October 16
Vehicular, Tuesday, September 26

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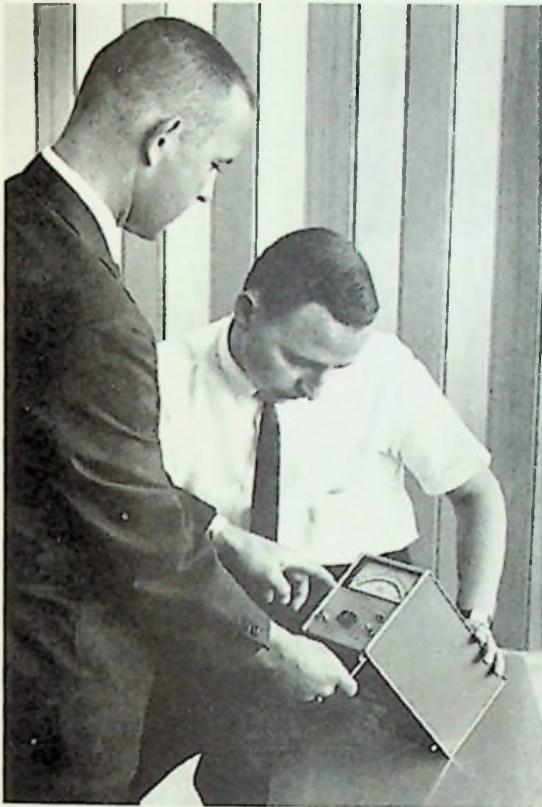
If you are an engineer experienced in educational systems analysis, electronic display development, and/or computer systems design, we'd like to talk to you. Current efforts include: development of concepts for advanced computer-based instructional systems; design of advanced CRT displays and electronic data entry devices; and design of the elements of digital processing and communications systems for use with computer-based information. Areas of work are: digital circuits; digital logic design; packaging; human factors engineering; display devices design; and analog circuit design.

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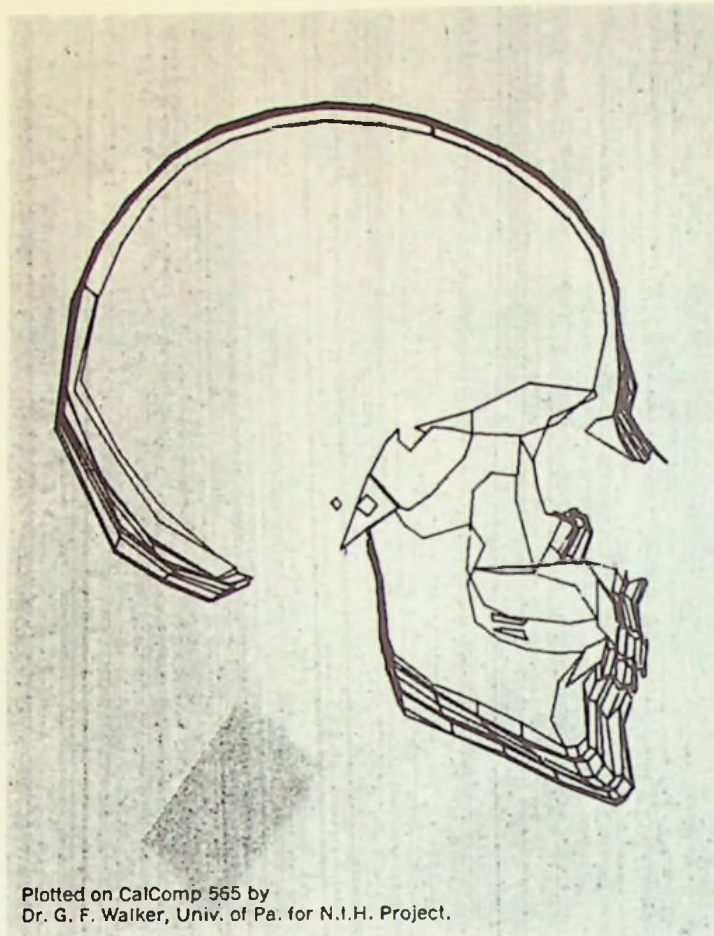
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cover story

SLAC BUBBLE CHAMBER

A 40-inch hydrogen bubble chamber, third largest in the U.S. and built in record time, has gone into operation to detect "nuclear events" that occur when hydrogen nuclei are bombarded by high-energy particles from the two-mile long "electron gun" at the Stanford Linear Accelerator Center (SLAC).

Bubble chambers are among the most complex and sophisticated instruments used to "see" sub-nuclear particles in action. They enable physicists to photograph tracks left behind by the speeding invisible bits of matter.

Such pictures, taken in other bubble chambers, have contributed immensely to our knowledge of the atomic nucleus, and hence to what we know about the true nature of matter itself.

The massive new SLAC chamber, comparable in size and weight to a modern locomotive and in accuracy to a Swiss watch, was built in two and a

(Continued on page 18)

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1967-68

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1967-1968



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(Continued on page 6)

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- differential
- sampling
- spectrum analysis



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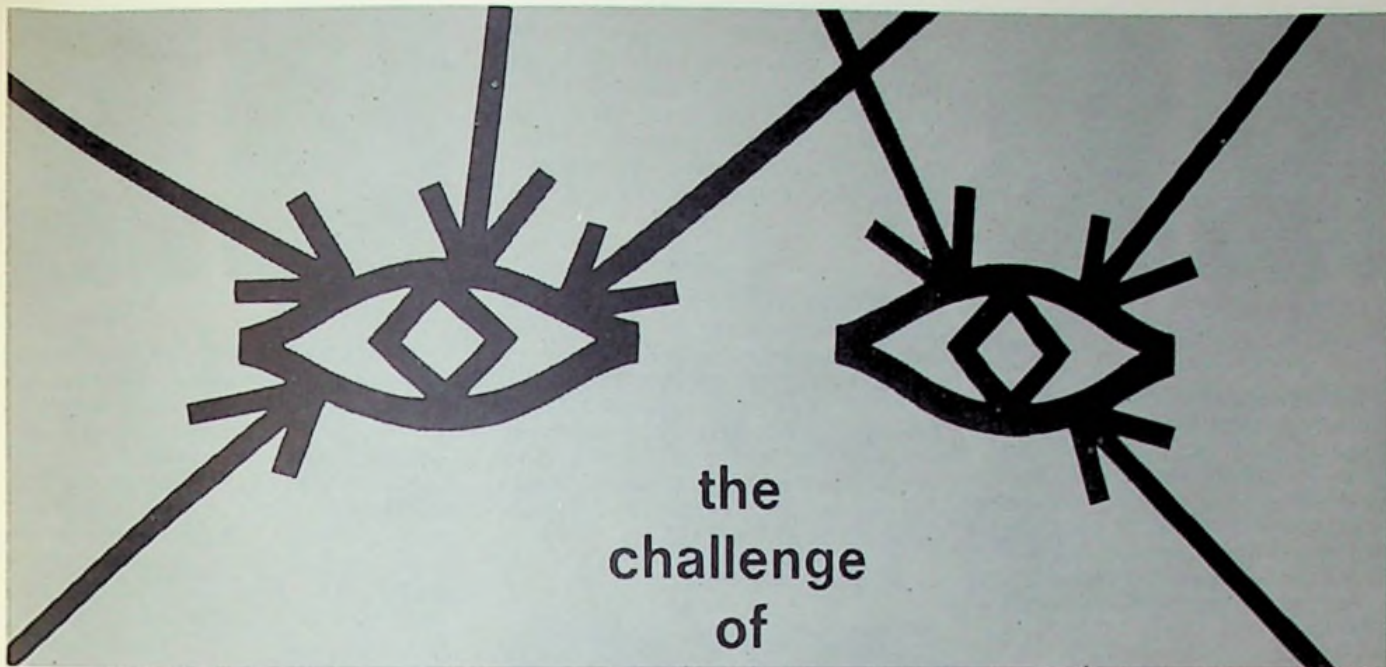
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(Continued on page 8)



the challenge of visibility

Does anybody know you're there?

Let's face it, many engineers feel safe as the unknown, no-name, undiscovered, anonymous man. "Others" desire recognition and its attendant rewards. A portion of these "others" possess the talent and professional maturity to meet the challenge of visibility.

These "others" are the men we want.

DISPLAY DEVICES ENGINEERS

Our Challenge: Assignments will be in one or a combination of the following devices or technologies: Hi-resolution CRTs, storage CRTs, hi-efficiency phosphors, converters, etc.

Our Man: Requires a degree in EE, Physics or Chemistry and 5 years pertinent experience. Should be design and production oriented and have good growth potential.

MICROWAVE TUBE ENGINEERS

Our Challenge: Design and development of high-power Klystron, high- and low-power traveling wave tubes.

Our Man: Degree in Electrical Engineering or Physics with experience in microwave tubes and electro-magnetic theory.

ELECTRICAL ENGINEERS SOLID STATE CIRCUITRY

Our Challenge: Design of solid state circuitry for inverters, regulated power supplies, pulse modulator, video amplifiers, etc.

Our Man: BSEE with 3 years experience in the design of solid state circuitry. Must be able to work independently to develop prototype subsystems.

PROJECT ENGINEERS DISPLAY TUBES

Our Challenge: Design & development of high definition CRT display systems. Design of solid state circuitry for deflection amplifiers, video amplifiers, power supplies, etc. Customer liaison to define system parameters & establish design goal.

Our Man: BSEE with 3 to 5 years experience in the design of analog solid state circuitry.

Men to meet the challenges listed above may send confidential resumes to Mr. Robert J. Moore,



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w e s c o n

PAPPENFUS FOR LEIFER

E. W. Pappenfus, vice-president, engineering, Granger Associates, Palo Alto, elected Section/WESCON director by the membership of the San Francisco Section in May, will take office on the WESCON board in November. Vice-chairman of the WESCON 67 technical program committee and chairman of the Future Engineers Show in 1965, Mr. Pappenfus is past chairman of the Cedar Rapids Section. A Fellow of IEEE and a member of the papers review committee for three years, he also serves on the communications systems disciplines committee and the radio communications committee. He has been a member of the Fellows committee of the San Francisco Section since 1965.

Pappenfus succeeds Meyer Leifer, vice-president, scientific instrument operation, Melabs, Palo Alto, who has served the San Francisco Section and WESCON as director, 1962, chairman, board of directors, 1965, director, 1966, and chairman, executive committee, 1967. A Fellow of IEEE and past chairman of the San Francisco Section (1957-58), Mr. Leifer has served on the section Fellows committee and in many other capacities for many years.

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SUBSECTIONS AND CHAPTERS PROGRAM SCHEDULE
San Francisco Section, 1967-68

	Monday	Tuesday	Wednesday	Thursday
SECOND		Instrumentation & Measurement Power Magnetics	Microwave Theory & Techniques	Industry & General Applications Antennas & Propagation
THIRD	Vehicular Group Electromagnetic Compatibility Systems Science & Cybernetics	Automatic Control Engineering in Medicine & Biology Nuclear Science	Circuit Theory Santa Clara Valley Subsection Communication Technology	Reliability Audio & Electroacoustics Information Theory
FOURTH	East Bay Subsection	Computer Parts, Materials & Packaging Engineering Management	Electron Devices Industrial Electronics & Control Instrumentation	Aerospace & Electronic Systems Education

Meeting Guide

SEPTEMBER 19, TUESDAY, 7:00 PM—Communication Technology
Wine tasting and barbecue (limited to 100 persons)

Place: Paul Masson Winery, Saratoga
Dinner: Barbecue steak dinner following wine tasting; \$5.00 payable at winery
Reservations: Milton Seymour, 593-8491 before Sept. 19

SEPTEMBER 19, TUESDAY, 8:00 PM—Engineering in Medicine & Biology

Time series techniques in medicine and biology
Richard Wexler, manager, technical marketing, Time Data Corp., Palo Alto
Place: Stanford Medical Center, Room M-114
Dinner: 6:15 PM, Red Cottage, 1706 El Camino, Menlo Park
Reservations: Mrs. Lyn Davis, 321-1200, ext. 5353 by noon Sept. 19

SEPTEMBER 20, WEDNESDAY, 8:00 PM—Microwave Theory & Techniques

Computer use in microwave engineering:
1. *A computer-controlled microwave network analyzer by Richard W. Anderson, manager, network analyzer section, Hewlett-Packard Co.*
2. *Numerical computation of fields in a waveguide of arbitrary cross-section by Charles W. Steele, associate member, research staff, Ampex Corp.*
Place: Hewlett-Packard auditorium, 1501 Page Mill Road, Palo Alto
No dinner

SEPTEMBER 23, SATURDAY, 5:30 PM—Santa Clara Valley Subsection/Monterey Student Branch

Wine tasting dinner; introduction of new officers
Place: Cademartori's, San Juan Bautista
Dinner: After wine tasting at Cademartori's Patio (limited to 90 persons)
Reservations: Monterey: Lt. Battenburg, 375-4558; San Jose: Miss Chris Mazzeo, 291-4014; Palo Alto: Don McCauley, 326-4350 ext. 4309 no later than Sept. 20.

SEPTEMBER 26, TUESDAY, 8:00 PM—Computer Multiphase MOS logic

Gilbert M. Masters, member, research laboratory, Fairchild R&D Lab, Palo Alto
Place: Room 134, McCullough Hall, Stanford
Dinner: 6:15 PM, Rick's Swiss Chalet, 4085 El Camino Way, Palo Alto
Reservations: Sharon Rytting, 321-3300, ext. 451

(Continued on page 12)

Above is the schedule of meeting nights agreed upon at the August 9 program coordination meeting. In the event that a group finds it necessary to meet on a night other than that specified because of holidays, speaker availability or other causes, it is important that the Section office be notified immediately for the purposes of coordination and possible re-scheduling of other meetings to avoid conflicts.

The minimum number of meetings required per calendar year for chapters is two; for subsections it is five. Since the Section has more chapters than any other and competition for meeting nights is heavy, a long-standing policy of the Section has been to encourage meetings of high caliber and interest, even if the annual number is only at the minimum or slightly above, rather than the greatest possible number of meetings during the ten-month operating year (September through June). Chapters should consult with others assigned the same night to stagger their meetings by months and avoid conflicts. Appropriate joint meetings should also be arranged whenever possible.

Most Section meetings (five during the operating year) will be joint with sub-sections or chapters. When not joint, they will be scheduled during the first week of the month whenever possible to avoid conflicts. Contact Program Chairman J. E. Barkle or Group Coordinator B. J. McMurtry (see Directory) to arrange joint meetings with the Section.

The closing date for all meeting background material—calendar notice on standard form, speaker's biog, abstract and photograph—is the 5th of the preceding month.

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Fresno State College, Fresno, 93726, (209) 222-5161.

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Heald Engineering College: 1215 Van Ness Ave., San Francisco, 94109; 673-5500.

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San Francisco State College: 1600 Holloway Ave., San Francisco, 94132; 469-1529 (or 469-1228).

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**SEPTEMBER 26, TUESDAY, 7:30 PM — Vehicular
Living in a crowded world**

A. K. Guthrie, manager, product service engineering, General Electric Co.

Place: The Shadows, 213-2nd Ave., San Mateo

Cocktails: 6:00 PM

Dinner: 6:30 PM — \$4.00 including tax & tip

Reservations: Mrs. Nathan, 349-3111, ext. 220 by noon, Sept. 26

**SEPTEMBER 28, THURSDAY, 8:00 PM — Aerospace & Electronic
Systems**

**Choosing the right rocket—an overview of rocket propulsion
systems for aerospace applications**

*Jack M. Vogel, director, quality assurance div., United Technology Center,
Sunnyvale*

Place: Lockheed Auditorium, 3251 Hanover St., Palo Alto

No dinner

**OCTOBER 16, MONDAY, 8:00 PM — Systems Science & Cybernetics
The Stanford artificial intelligence project**

Prof. John McCarthy, Stanford University

Place: Stanford Research Institute, Bldg. 1, Conf. Rm B, 333 Ravenswood
Ave., Menlo Park

Dinner: 6:30 PM, Red Cottage, 1706 El Camino, Menlo Park

Reservations: Margie Hensley, 324-4701 by Thursday, Oct. 12

meeting ahead

ROCKETS FOR A&ES

Jack M. Vogel, senior staff member, United Technology Center, Sunnyvale, will discuss choosing the right rocket—an overview of rocket propulsion systems for aerospace applications at the September 28 meeting of the Aerospace & Electronic Systems chapter.

In 1955 Mr. Vogel joined the guided missile research division of the Ramo Wooldridge Corporation (later Space Technology Laboratories) where he was assigned responsibility for engine, accessory power, and fuel control systems on the Atlas and Titan programs and later established the development plan for the underground launcher for the Minuteman weapon system.

Since 1959, he has been a senior member of the staff of United Technology Center, and carried a major share of the responsibility of planning the facilities, organization and development programs of that company. He is presently in charge of all work being done in the areas of reliability and quality control.

The author of numerous publications in the field of solid and liquid rocket propulsion, he received his bachelor of arts degree in chemistry in 1942 and his master of science degree in chemistry in 1948 from the University of California.

United Technology Center, a division of United Aircraft Corporation, is engaged in a wide variety of rocket development—rockets, solid and liquid propellants, and advanced propulsion systems.



Vogel

Masters

meeting ahead

MULTIPHASE MOS LOGIC

Gilbert M. Masters, member, research laboratory, Fairchild Semiconductor, Palo Alto, will discuss multiphase MOS logic at the September 26 meeting of the Computer chapter.

Large scale integration using MOS transistors makes possible a novel approach to logic circuit design which promises high density, low power circuits which are faster than conventional MOS circuits. Multiphase logic is based on a system of clocks which control the movement of stored charge within the circuit while never allowing a DC path from power supply to ground.

Multiphase logic can affect logic design on several levels. One is at the detailed design level where careful coordination of the various signals must be made. At a higher level, the technique of pipelining arithmetic operations becomes easily implemented.

Dr. Masters received the B.S. and M.S. degrees in engineering from UCLA in 1961 and 1962 and the Ph.D. in electrical engineering from Stanford University in 1966. After spending a year in Europe he joined the Fairchild research and development labs in Palo Alto in February 1967.

meeting ahead

TIME SERIES TECHNIQUES

Richard Wexler, manager, technical marketing, Time Data Corp., Palo Alto, will discuss time series techniques in medicine and biology at the September 19 meeting of the Engineering in Medicine & Biology chapter.

The speaker has spent 15 years in biomedical research at the University of Illinois, Yale University, and the University of California, and subsequently in industrial product planning for biomedical instrumentation. His experience with the problems of analysis of time series events, such as electrocardiogram, electroencephalogram and pulse waves, led to the founding, with a group of colleagues, of Time Data Corporation.

Mr. Wexler will describe the types of data to which time series techniques may be applied, including data which does not necessarily occur over discrete time periods. The various methods, which have been developed in the past 30 years, for implementation of time series techniques such as spectral analysis, correlation, filtering, and averaging, will be discussed. In addition, he will describe the TIME/DATA 100 signal analyzer which has been developed for both laboratory and computer center use. The discussion will focus on how these various techniques apply to biomedical data, the selection of a particular analytic approach, how these decisions effect the course of a research program, clinical implications of these methods and some guidelines.

meeting ahead

SCVSS / MONTEREY

Wine tasting and dinner will highlight the September 23 joint meeting of the Monterey Student Branch and the Santa Clara Valley Subsection. The evening will culminate in introduction of the new officers and presentation of objectives for the new year.

Location of this event is Cademartori's Casa Maria in San Juan Bautista, in the heart of the Almaden Vineyards country. As a prelude to the meeting, Almaden Vineyards will present their finest wines at a tasting in the patio.

For those who arrive early, the mission and plaza buildings will be open to provide a glimpse of the history of this early California area.

San Juan Bautista is accessible by U.S. 101 from both San Jose and Monterey.

The wine tasting will commence at 5:30, with the dinner and meeting following. Because of the special quality of the wines and dinner, reservations are required and total attendance is limited to 90 persons. Deadline for reservations is September 20.



Wexler



Guthrie

meeting ahead

CROWDED WORLD

A. K. Guthrie, manager, product service, engineering communication products dept., General Electric, Lynchburg, Va., will discuss living in a crowded world at the September 26 meeting of the Vehicular chapter.

The talk concerns radio frequency interference as the number one system problem in the mobile radio communication field. Major emphasis is placed on those interference situations confined to the mobile services—cases where one mobile radio system interferes with another.

The effect of various forms of interference on the desired signal is discussed. Particular measurement methods are enumerated.

Each of the common mechanisms which give rise to interference situations are reviewed. Particular attention is given to power and frequency relationship.

Finally, the relative merits of currently available "cures" and "patches" are considered in the light of basic interference problems.

The speaker's duties include direction of Lynchburg-based mobile radio field engineers and providing technical leadership to field-based service managers. He is responsible, also for overall relations with General Electric authorized service stations.

A native of Bedford, Indiana, his twenty-plus years of experience in the mobile radio field started with Indiana State Police in 1947. Joining General Electric Company in 1953 as communication engineer at Indianapolis, he was later regional communication engineer at St. Louis. He transferred to Lynchburg in 1961 as commercial engineer, portable equipment product planning, and has been in his present position since 1963.

The IEEE Executive Committee has acted to encourage Student Associate membership in regionally-accredited junior colleges which have significant programs in engineering and physical sciences. Associate Student Branches can be established in institutions "other than schools of recognized standing" if approved by the Regional Director and the IEEE Executive Committee.

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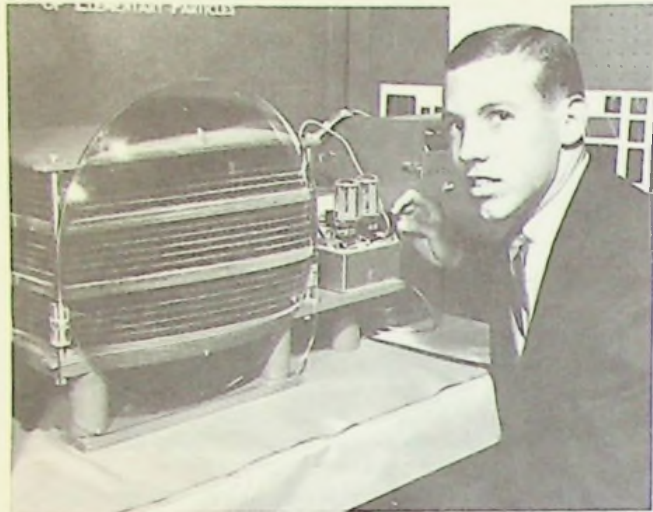
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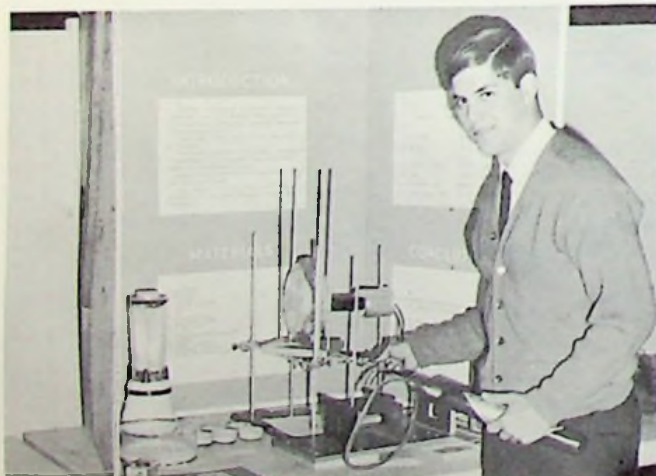
WESCON 67 RECORD FUTURE ENGINEERS SHOW



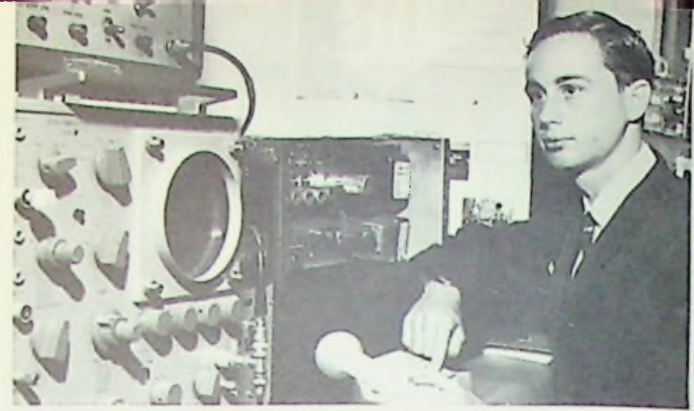
John Edward Lillig, of Pico Rivera, Don Bosco Technical High, South San Gabriel, "Detecting Elementary Particles with the Spark Chamber."



Peter Aronstam, Lowell High School, San Francisco, "Binary-Digital Electro-mechanical Computer."



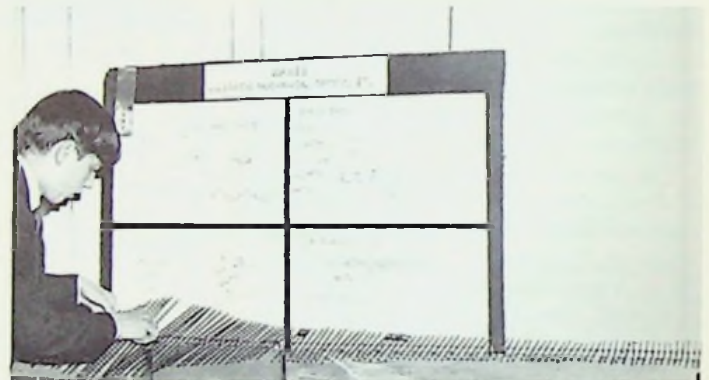
Larry B. Sorensen, 17, Peterson High School, Sunnyvale, "Mechanical Stimulation of Luminescence Induced by Breaking Chemical Bonds."



William Albert Strack Jr., 17, of Santa Ana, Foothill High (Tustin), "Practical Application of Touch Tone (telephone) Signalling to Two-Way Communications."



Niles Severy, Santa Rosa Sr. High School, "Radioactivity Measurements with Home-Made Scaler."



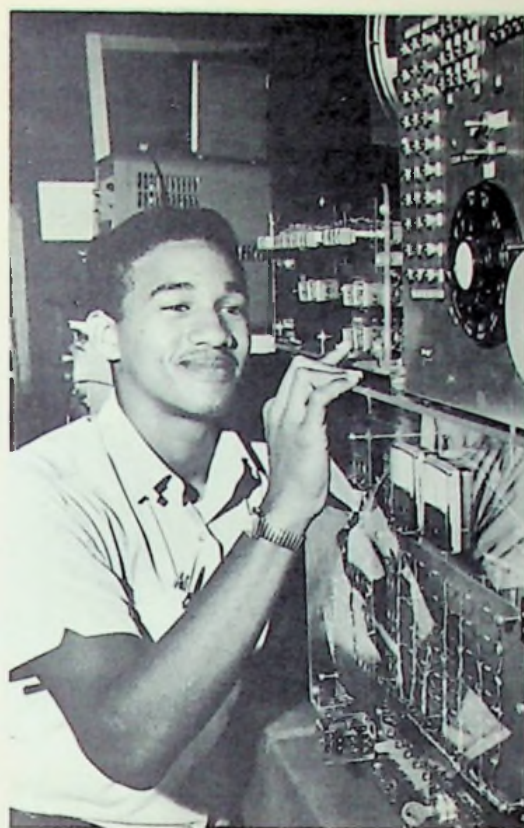
Rick Mann, Fremont High School, Sunnyvale, "What Are Waves and How Do They Behave?"



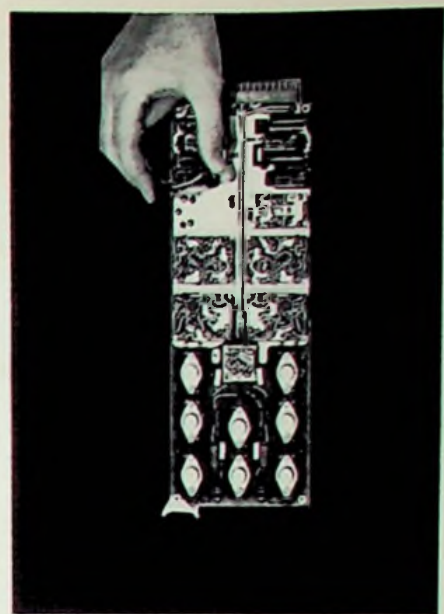
Masaaki Yamato, 17, Oakland High School, "Ion-Propelled Aircraft."



John Stephen Borjon, 17, Wasco Union High School, "Ultrasonic Doppler Motion Indicator."



Eugene W. Warren, 17, Los Angeles High School, "Conic Parabla Equation Point Calculator."



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meeting ahead

COMPUTERS IN MTT

Two speakers will discuss aspects of computer use in microwave engineering at the September 20 meeting of the Microwave Theory & Techniques chapter.

Richard W. Anderson, manager, network analyzer section, Hewlett-Packard, Palo Alto, will describe a computer-controlled microwave network analyzer. He will discuss the operation of a new piece of test equipment which allows automatic and rapid execution of wide-band microwave measurements, with automatic data correction provided by subtracting residual errors and ambiguities from measurements through computer storage and processing. Rapid data manipulation is also possible by direct calculation of derived parameters such as gain/loss, impedance, VSWR, phase shift, and "h", "y", "z", or "s" network parameters. General principles will be discussed indicating the ways in which computers may revolutionize the microwave measurement field.

Charles W. Steele, associate member, research staff, Ampex, Redwood City, will discuss numerical computation of fields in a waveguide of arbitrary cross-section. A solution of Maxwell's equations within a waveguide of arbitrary cross-section by a set of finite-difference linear equations will be presented. Both TE and TM modes are analyzed, with cutoff parameters calculated and mode patterns automatically plotted. The method is easily computerized, and its accuracy dependent only upon the number of computed points, or the length of the program. Results will be given for circular, rectangular, ridged, and cruciform waveguides. Possible additional applications of the technique will be discussed.

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

events of interest

NUCLEAR SCIENCE SYMPOSIUM

The 14th Nuclear Science Symposium will be held October 30-November 2 at the Statler Hilton Hotel, Los Angeles. Sponsors are IEEE, AEC and NASA. Subjects will be nuclear power—instrumentation, control, operation and standards; instrumentation for space and laboratory, radiation detectors, space phenomena, and medicobiological applications. General chairman is J. Forster, General Electric, 175 Curtner Ave. MC037, San Jose, Calif. 95125. Program chairman is R. C. Maninger, Lawrence Radiation Laboratory, P.O. Box 808, Livermore, Calif. 94550. Exhibits chairman is J. F. Osborn, General Electric, 175 Curtner Ave. MC517, San Jose, Calif. 95125.

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laser news

ENERGY FROM FLAME ACHIEVED BY SCIENTIST

The oldest source of heat and light, flame, has been successfully used to generate the newest, laser energy, it was disclosed recently by Carver Corporation in Mountain View, California. The discovery, resulting from a project jointly supported by Carver and Mobil Oil Corporation, was reported by Dr. Irwin Wieder, Carver's principal scientist and inventor of the method.

The Carver laser is unique in that it requires only chemical energy for its operation, whereas previously reported "chemical lasers" have required substantial amounts of auxiliary electrical apparatus. The laser's principle of operation involves a new technique, called chemi-optical resonant pumping, in which radiation from molecules newly formed in flames or explosions is absorbed by identical molecules physically separated from the combustion process.

The initial experimental version of the laser utilizes a tube of CO² gas in a laser cavity, pumped by radiation from a carbon monoxide flame. Continuous output power of 1 milliwatt of infrared energy is reported, with much higher power expected in future versions of the apparatus.

Dr. Wieder said that in addition to their extremely high power potential, chemical lasers will ultimately be useful in remote places with no access to electrical power. Future programs at Carver include plans for increasing the efficiency of the device and utilizing more common fuels for pumping.

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

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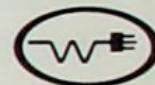
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IT IS REPORTED:

Edward S. Hensperger has been appointed manager, filters and semiconductor devices department of Melabs, Palo Alto, and will supervise product development.

Artwell Electric, Inc., San Francisco, has won a first place travel award in a national sales competition for Allis Chalmers distributors and agents. The company earned the award for industrial products sales it generated in excess of an assigned quota in 1966.

Tony Latus has been promoted to development section head in the microwave components product engineering department of Western Microwave Laboratories, Inc., Santa Clara.

Royco Instruments, Inc., Menlo Park, has announced the appointments of Malcolm Ogle as director of engineering and Robert Tamblyn as controller.

Dr. Jobe Jenkins, former manager, application satellites, NASA programs, Lockheed Missiles & Space Co., has been appointed chief of technical planning for Philco-Ford Corp.'s western development laboratories division.

MORE ON SLAC BUBBLE CHAMBER

half years by a 50-man group of SLAC engineers and technicians. Similar chambers have required at least twice that long to build.

Group leader Richard L. Blumberg estimates the job represents about 90 man-years of work and cost approximately \$2.5 million. Other key experts included Dr. Stephan J. St. Lorant, controls and refrigeration specialist, and John W. Mark, mechanical engineer. Prof. Joseph Ballam, SLAC's research division director, supervised the project.

Like the rest of the SLAC operations, the bubble chamber construction was supported by the U.S. Atomic Energy Commission. SLAC experimental facilities are available to all qualified scientists. Eight universities are represented among initial experiments to be scheduled with the chambers.

The stainless-steel chamber itself is cylindrical, 40 inches in diameter and 20 inches deep. It holds 100 gallons of liquid hydrogen. High-energy particles enter the chamber through a thin aluminum window on one side, and three pictures are taken simultaneously from three different angles through an eight-inch-thick glass window at one end.

A high-vacuum tank, plus hundreds of layers of aluminized plastic sheet, insulate the chamber from the outside temperature. The liquid hydrogen inside

Lynch Communication Systems, San Francisco, has announced receipt of its largest single order—approximately one-half million dollars for transmission equipment ordered by Graybar Electric Co., Pittsburgh, for delivery to the First Colony Telephone Co. of St. Mary's, West Virginia.

Philco-Ford Corp. has formed a ground terminal operation within its western development laboratories division and appointed Robert F. Friedman as director. The new operation will be charged with the development, design, installation, checkout, logistic support and marketing of antenna systems.

Harvey A. Berger has joined Tekmar Instruments, Inc., engineering sales representatives, as vice-president and manager of the new sales office in San Mateo. Tekmar provides representation for firms in optics, chemistry, physics, electronics and oceanography.

Lotfi A. Zadeh, professor of electrical engineering, UC, Berkeley, and Gordon S. Kino, professor of electrical engineering, Stanford, were among 294 recent recipients of John Simon Guggenheim Memorial Foundation fellowships from among more than 2,000 applicants.

is thus kept at approximately 414 degrees below zero (Fahrenheit), or nine degrees above its boiling point.

An unusual feature of the SLAC bubble chamber is its lack of an elaborate refrigeration system to maintain the low hydrogen temperature. The builders found that bulk production of liquid hydrogen has so reduced its price since earlier bubble chambers were built that they could afford to use the liquid directly from commercially supplied tanks.

A bellows-operated piston on the other end of the chamber keeps the hydrogen at five times atmospheric pressure, which prevents its boiling. When nuclear events are to be recorded the piston drops the pressure to 2.5 atmospheres. High-energy particle tracks then become clearly visible as the speeding bits of matter boil the liquid hydrogen into vapor bubbles as they pass through it. The pictures are obtained by scattered light from these tiny bubbles.

Also surrounding the chamber is a 300-ton electromagnet of 26,000 gauss—52,000 times stronger than the earth's magnetic field. The magnet is used to bend the paths of the particles into circular arcs. Since the radii of the arcs are proportional to the momentum

(Continued on page 20)

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MORE BUBBLE CHAMBER

of the particles, their measurement helps the physicist identify and understand the sub-nuclear event.

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About 150,000 operations have been performed in this manner in tests of the SLAC bubble chamber. Later the builders plan to add scintillation counters that will detect actual events in advance of picture-taking. This will greatly reduce the number of pictures needed.

The entire bubble chamber building is on wheels, enabling the experimenters to move it to any part of the SLAC target area. The chamber is controlled remotely from a smaller portable building alongside.

SLAC's bubble chamber is somewhat smaller than others at New York's Brookhaven National Laboratory, at CERN in Switzerland, and at Rutherford National Laboratory in England. A 72-inch bubble chamber at Lawrence Radiation Laboratory in Berkeley is being rebuilt to an 82-inch chamber, however, and will be brought to SLAC later.

The SLAC chamber is probably the last of its "generation" that will be built, according to Prof. Ballum. Most of the big high-energy laboratories have plans for much larger, room-size chambers, he said.

He also expects results with bubble chambers at SLAC to be especially interesting because of the accelerator's unique ability to produce photons (X-ray and gamma rays) of precisely known energies.

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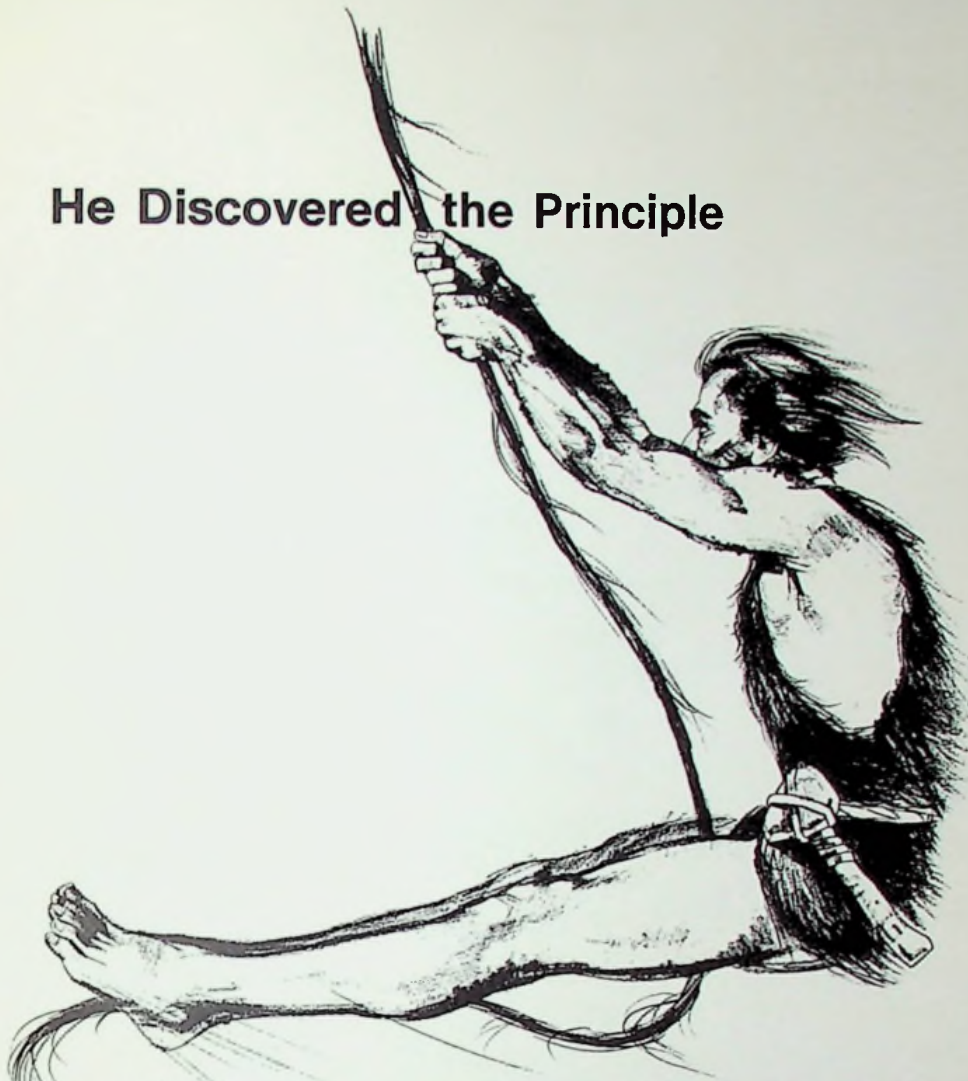
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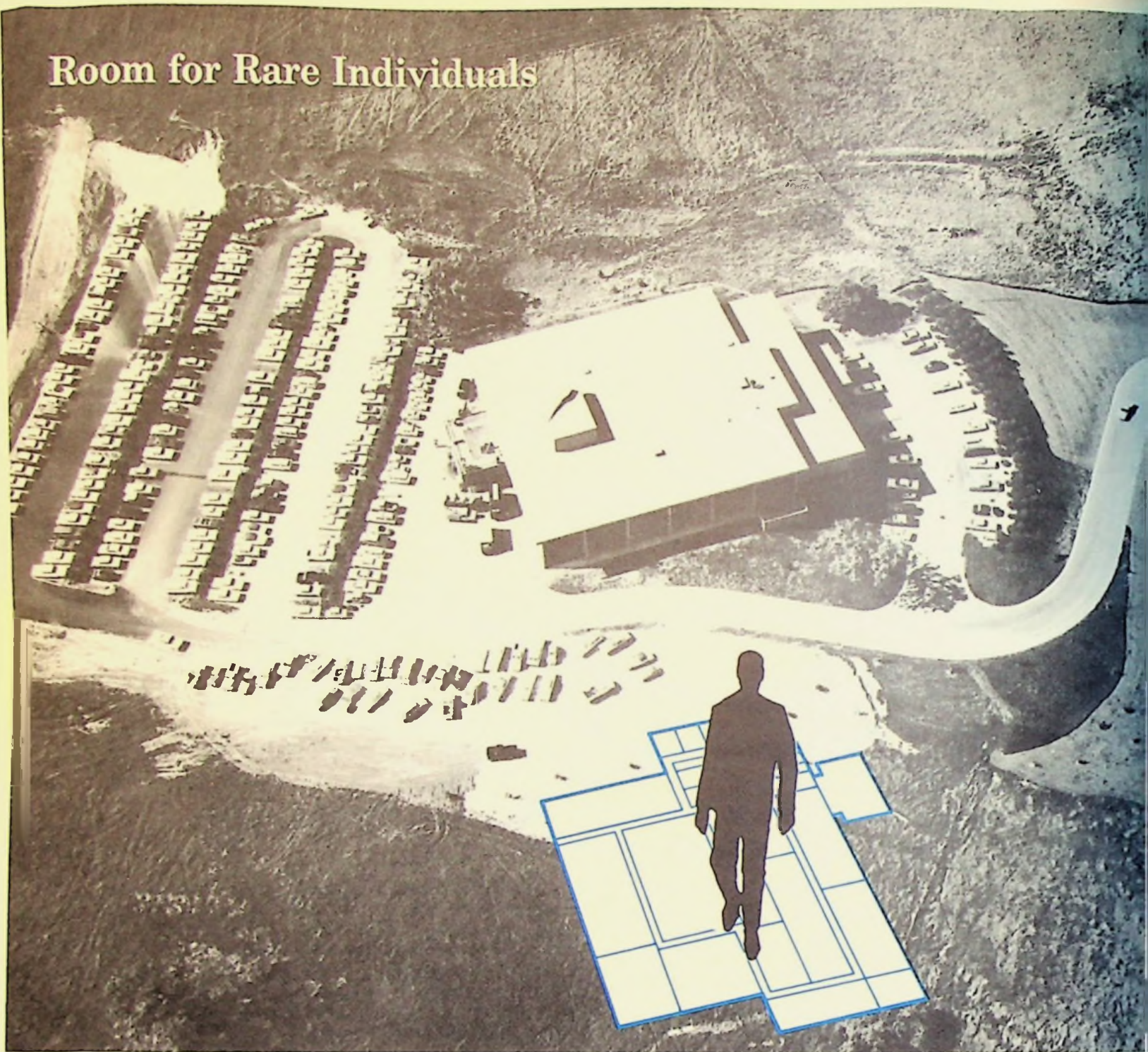
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