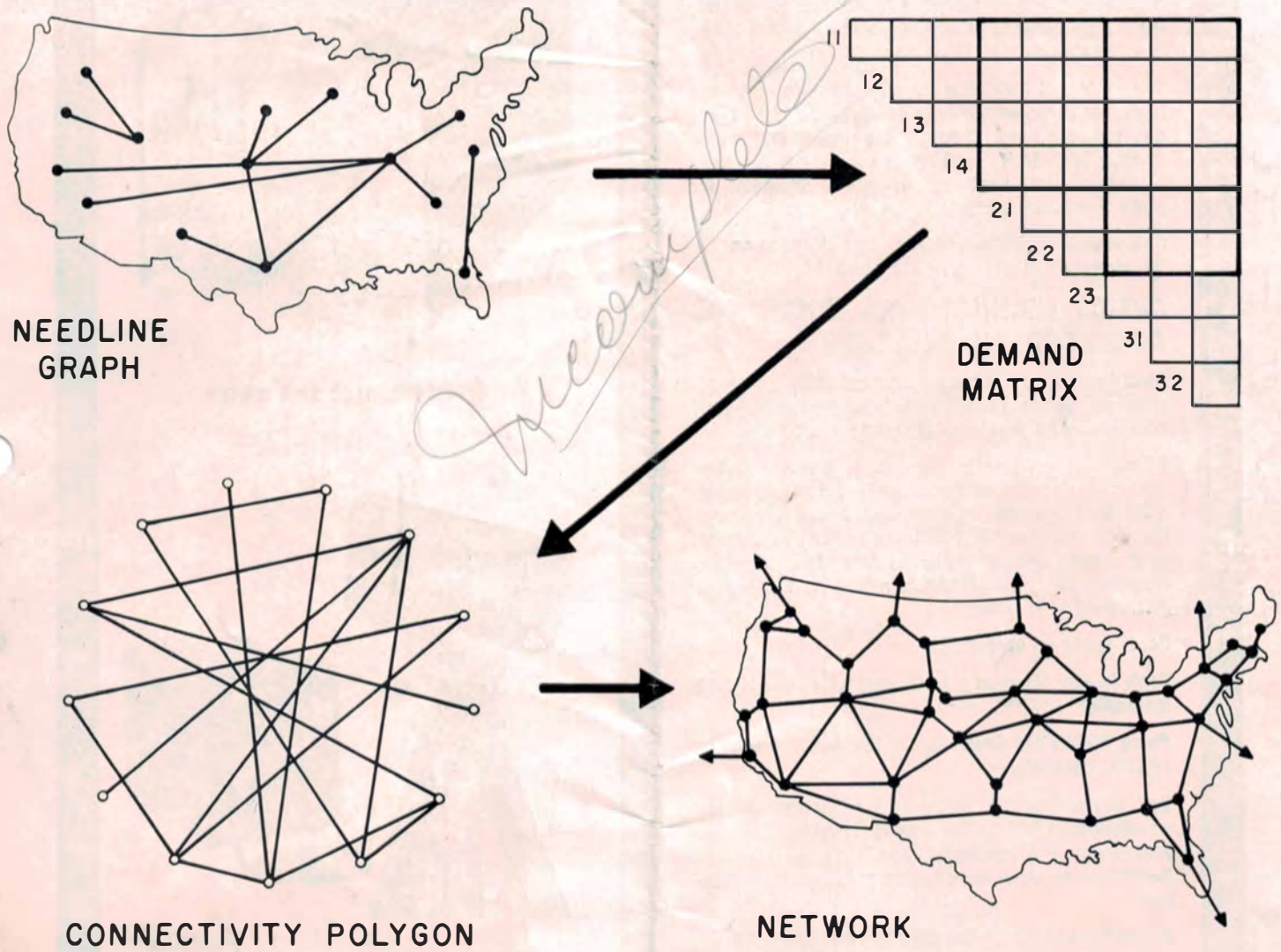
NORTHERN NJ SECTION

The Newsletter

The Magazine of the Northern New Jersey Section of the IRE

Volume 8 JANUARY, 1962 Number 5



January Section Meeting

ITT Researcher to Survey Today's and Tomorrow's Communication Systems

Place: Hillside Avenue School
Montclair, N. J.

Date: January 10, 1962
Wednesday, 8:00 P.M.

Pre-Meeting Dinner: Three Crowns Restaurant
Montclair, N. J.

NEW INSTRUMENTS

NEW hp SWR METER OFFERS HIGH RESOLUTION

Hewlett-Packard's new SWR Meter, Model 415C, provides pinpoint resolution for precise rf attenuation measurements.

This newly developed standing wave indicator is essentially a high gain (greater than 100 db), low noise audio amplifier coupled with an output voltmeter (calibrated for square-law detectors) to read SWR or db directly.

The amplifier is tunable from 980 to 1,020 cps. The variable 15 to 100 cps bandwidth permits the meter to be used for both high-sensitivity and swept-frequency applications.

Improved, constant resolution is obtained by expanding 2.5 db portions of any 10 db range to full scale, thereby eliminating "blind spots."

The hp Model 415C has an ac output for use as a high-gain tuned amplifier and also provides a dc output for recorders. Because the instrument reads directly in SWR, it is extremely useful for measuring reflection coefficient and as a null indicator for audio-frequency bridges.

Call your RMC field engineer for full specs on hp Model 415C which is priced at $325.

hp MODEL 415C SWR METER

OPTICS TECHNOLOGY'S MODEL 100 ADVANCED PULSE LASER

RMC Associates has been appointed sales representative for Optics Technology, Inc., manufacturer of special optical devices and equipment.

Pictured here—greatly reduced in size—is Optics Technology's new advanced pulsed LASER, Model 100. This inexpensive new instrument accommodates materials to 4½" in length and ½" diameter. It is offered with a choice of two power supplies. A tripod and optical bench mounting fixture are offered as accessories.

Some specs on Model 100:

Peak Power: Nominally 1 kilowatt with ruby LASER materials.

Pulse Width: Nominally 0.5 milliseconds with ruby LASER materials.

End Reflectors: ¾" multi-layer reflectors at ruby wavelength of 6943 A° in rugged Fabry-Perot design. Absorption and scattering nominally below 0.2%. Reflectors for other wavelengths readily interchangeable.

Power Supply: Variable from 0 to 1800 volts.

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OPTICS TECHNOLOGY MODEL 100 LASER

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EDITORIAL NOTES

IRE & AIEE = ?

Most people — and engineers are considered people in some circles of society — dislike change. You have heard the old cliche — if it was good enough for my father it's good enough for me — well, once in a while a change is proposed that is so big that the magnitude and the ultimate manifestations of the change go beyond the every day thinking powers of an engineer. (In other words — somebody's rocking the boat.) Now there are many questions that are in the minds of our readers, questions that could help or hinder the merger of the IRE with the AIEE or is it the AIEE with the IRE? Some of these questions are difficult to answer but we should think about:

1. Are we too big?
2. Are we serving the interests of the membership today? If not — will more members help?
3. Will the AIEE (if merger is approved) become a PG on Power — possible 70,000 membership?
4. Will the new organization extend to the old IRE members the insurance coverage carried by the old AIEE members?
5. Will our new National Officers be selected by AIEE standards or do we use the IRE standard and get the best man for the job? (The trend may be there now.)
6. The IRE assets are three times greater than the AIEE assets. (I don't know if this includes the real estate we own at 79th and 5th Ave.) Of course this editorial is not for or against the merger. The membership must make the ultimate decision. We hope in the next few issues to publish letters from the membership that are for the merger and against. The future of our organization lies in your hands. Unfortunately I'm afraid that of the 4,300 members of the NNJ section only a handful will express their opinion, and this minority of the membership will decide your future in the new organization and in the IRE. Let yourself be heard.

NEWSLETTER AMPLIFIER

The editorial staff and committee established to find a new name for your section magazine have selected the name Amplifier and will propose it to the Executive Committee on Jan. 24th. If it is approved, the name will become effective in the March issue.

Edward J. Byrum

ANNUAL BANQUET AND FELLOWS AWARD

WILL BE HELD MARCH 14, 1962

PLACE AND SPEAKER TO BE ANNOUNCED

The Northern New Jersey

Newsletter

Published monthly by the Northern New Jersey Section of the Institute of Radio Engineers

Deadlines for all material are the first of the month preceding each month of publication.

All communications concerning the NNJ Newsletter, including editorial matter, advertising, and mailing, should be addressed to:

N.N.J. NEWSLETTER
P.O. Box 226 - Glen Ridge, N. J.
Telephone: PIlgrim 4-0453

1961-1962 Meeting Schedule

Section Meetings	Exec. Comm. Meetings
January 10, 1962	January 24, 1962
February 14, 1962	February 28, 1962
March 14, 1962	March 28, 1962
April 11, 1962	April 25, 1962
May 9, 1962	May 23, 1962
June—Field Trip	June 27, 1962

THE FRONT COVER:

Users' communication needs (A wants to talk to B, D to E, X to Y, etc.) can be represented by a Needline Graph, which depicts the total, but unorganized, requirements of a communications system. Before an orderly system can be evolved, however, two stages of systems engineering are required. First, the users' requirements are represented mathematically by a Demand Matrix. From this, the best possible route for all messages can be determined (Connectivity Polygon). The result is an orderly communications network which satisfies users' requirements by the most effective means.

FOR DC-to-15 MC APPLICATIONS

Tektronix Types 515A, 516 Oscilloscopes

These two compact Tektronix Oscilloscopes ideally suit most general-purpose measurement applications in the dc-to-15 mc range. They display bright traces with excellent definition.

You may prefer the Type 515A Oscilloscope if you work exclusively with single-trace applications in the laboratory, in the field, or on the production line. Or, you may prefer the dual-trace facility of the Type 516 Oscilloscope. It offers you four operating modes and independent controls for each amplifier channel—enabling you to position, attenuate, invert input signals as desired.

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Type 515A MOD 101 (50-400 cycles)	835
Rack-Mount Models also available	
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Type 516 MOD 101 (50-400 cycles)	1035
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January Section Meeting

ITT RESEARCHER TO SURVEY TODAY'S AND TOMORROW'S COMMUNICATION SYSTEMS

By Brian Eden

The new year is beginning with a "boxcar" full of new and challenging problems for the engineer to solve. Scattered throughout this boxcar are also a number of old problems which are new in the sense that they get tougher and tougher to solve as the world becomes more and more complex—technologically, politically and sociologically. One of these problems, which seems to be gaining in perplexity more rapidly than solutions can be found, lies in the gamut of telecommunications.

This problem, now prevalent on a global basis, will be discussed at the January NNJ Section meeting by Joseph W. Halina, Associate Director of Engineering at ITT Communication Systems, Inc., Paramus, N. J. The company is the prime contractor for USAF Project 48OL (Global Communications) from which Mr. Halina will draw some of his approaches and speculations on present and future communications system design problems. (See boxed insert for meeting time and place.)

Where Do We Stand?

The increasing interdependence of human beings on each other has created a large-scale and fateful reliance of world society on telecommunications. To point up this fact, we only need mention the intense daily impact of occurrences in places as remote and unfamiliar as Laos, the Congo, British Guiana, Iran, and others on the lives of Americans. Domestically, and on a less macroscopic scale, we might mention the dependence of every household on the availability of economical and reliable telephone service.

Thus, if communication systems engineering is a matter of broad concern today, it is because the revolution in demand for communications has outraced the natural pace of technological and conceptual development. Swiftly moving aircraft, missiles, the crowded skys and highways, and transportation in general; the discovery of thermonuclear energy resources and the potential world-wide effects of their use and misuse; the increasing proportion of time spent by decision makers on the move; the evolution of data processing complexes which ingest, generate, and exchange large volumes of information — these are the new factors in the world of the telecommunications planner, and all of them have appeared on the scene in the last one to two decades.

The communicators' "bag" of resources, on the other hand, has grown less rapidly. Of these — the long haul wideband waveguide, the wideband submarine cable, the communications satellite, the electronic switch, and the microwave radio relay — all but the last are still in the experimental stage.

How does one characterize the new communication needs in the first place and, having done so, how does one proceed to evolve system development plans? What are the constraints of past investments in large scale communications systems, developed in the absence of the new demand factors, on designs for tomorrow? How does the overall shape of communications systems in the next decade or two appear from the vantage point of today? How shall the developments be managed? These questions are indeed intriguing — many of them highly controversial — and although Mr. Halina will not have all the answers, his survey and speculation of them should leave the engineer with a great deal of food for thought . . . on the subject of communication systems design. Don't miss it!

MEETING FACTS

Speaker . . .	J. W. Halina Associate Director of Engineering, ITT Communication Systems
When . . .	8:00 P.M., Wednesday, January 10
Where . . .	Hillside School Montclair, N. J.
Dinner . . .	6 P.M., Three Crowns Restaurant, Montclair, N. J.

J. W. HALINA

Joseph W. Halina was born in 1920. After serving in the Signal Corps of the Royal Canadian Army for five years, he attended the University of Toronto and was awarded his B.Sc. degree in electrical engineering in 1949.

From 1949 to 1953, he was with the General Electric Company doing microwave engineering and later product planning and market research. During 1953-1954, he served the Lenkurt Electric Company as a consulting engineer on microwave problems. For the next two years, he was chief engineer of single-sideband carrier equipment for Lynch Carrier Systems.

In 1956, Mr. Halina joined ITT Federal Laboratories where he had the overall responsibility for the design of the K31 rural carrier system and the K24 exchange area carrier system, which was a first in telephony in that it was a fully transistorized medium capacity system and one utilizing dsb-sc modulation.

Mr. Halina is presently an Associate Director of Engineering at ITT Communication Systems, Inc., a systems engineering organization founded in 1959 to support the USAF 48OL program. The mission of 48OL is to formulate a comprehensive plan for the standardization and integration of USAF global communications facilities and for its evolution into an advanced capability for the future.

CHAIRMAN'S CORNER

Hugh S. Wertz

I would like to wish each and every one of you a very happy and a prosperous New Year. From all accounts, 1962 gives every promise of being a good year from a business standpoint and I hope that we will have an excellent year in the IRE.

With the birth of a new year, it is the custom to look back on the old year just past and then to look ahead. 1961 has a very satisfactory year from the standpoint of the Northern New Jersey Section. We have had excellent meetings, most of them very well attended, and two outstanding Lecture Series. While the returns of the Fall Series are not all in, it can be safely said that it was not only outstanding from a technical standpoint, as shown by the large attendance and the interest shown at the meetings, but also from the financial side as well. Many thanks should be given to the Executive Committees of both the present and immediately preceeding administration for their efforts during 1961.

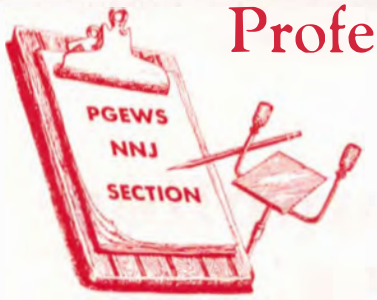
Looking ahead to the new year, our first meeting will be on January 10th at the Hillside Avenue School in Montclair. Mr. Joseph Helena will speak then on the subject, "Communications Systems Design, a Summary and a Projection." The pre-meeting dinner will be held at the 3 Crowns Restaurant in Montclair.

The February 14th meeting will be at the ITT Federal Laboratories Auditorium and the speaker will be Dr. H. I. Ewen of Ewen-Knight Corporation. His topic will be "Radio Astronomy and Microwave Radiometry." Dr. Ewen is the co-discoverer of the hydrogen line in cosmic radiation and he has done a considerable amount of work in radio astronomy. The pre-meeting dinner will be at the Copper Hood Restaurant in Rutherford.

While all of you will hear about this later, don't forget to make a note on your calendar for March 14th, our Annual Fellows Night. We want each of you to come and to bring your wife as the subject should be of great interest to both. Plans are shaping up for a very interesting Spring Lecture Series and details will be found elsewhere in this issue.

All in all, we are looking forward to a very interesting year, during which the subject of the merger with AIEE will be give more and more prominance and discussion. So I hope that your interest in IRE will be continued and even increased.

Again, a happy new year to all!



Professional Group on Engineering Writing and Speech

JANUARY MEETING

FORMULA FOR PLATFORM POISE

A formula for platform poise will be the topic demonstrated for the members and friends of the NNJ Chapter of PGEWS. Mr. R. J. Norko, training manager at the Harrison plant of the Radio Corporation of America will present the latest techniques for delivering a good speech with emphasis on poise. If you plan to deliver a talk before a group Mr. Norko's formula will assure you success as a speaker. His formula for *platform poise* was published in the Transactions of the IRE PGEWS, March 1958 and was presented before the First National Symposium of PGEWS, Oct. 21-22, 1957 - NYC.

RUDOLPH J. NORKO

Graduate of Rutgers—The State University, B.S. in Bus. Admin.

After 15 years with Prudential Insurance Co., joined RCA in 1953 as manager Safety & Insurance, Woodbridge Plant RCA.

Became Manager Training & Org. Dev. for Woodbridge Plant, 1956.

Transferred to RCA Harrison, N. J. plant and is presently providing Training & Org. Dev. Services for both Harrison & Woodbridge plants.

Former President Industrial Mgmt Club of Perth Amboy & vicinity.

Graduate of Dale Carnegie course.

Five time director of Dale Carnegie Groups.

Conducted 7 Public Speaking Courses at Harrison, N. J.

WHEN —	Thursday Jan. 18, 1962
TIME —	8:00 P.M.
WHERE —	Verona Public Library Verona, N. J.
FRE-MEET DINNER —	Three Crowns Montclair, N. J.

A REMINDER

The Professional Group on Engineering Writing and Speech (PGEWS) concluded last year's season with a dinner meeting in June. This meeting highlighted the first anniversary of the NNJ Chapter. Those who attended last year's affair agreed that a similar meeting should be held this year.

Your program committee has started plans for our June meeting. The committee would appreciate suggestions on how it can make this meeting more meaningful and more worthwhile to you. Won't you call or send your suggestions to the program committee chairman, Mr. Walter Smith (Business Address: RCA Building 11-2, Harrison, N. J. Phone: HU 5-3900, Extension 3257.)

During the year it is most difficult to get all of our members out to all of our meetings. Other meetings, business commitments, school, etc., account for only a few of the many reasons why members cannot get to our meetings. Won't you plan now to set aside this one evening to assure that you will be present with your fellow members?

We will all be looking forward to seeing you.

William C. Willmot
Publicity Chairman
PGEWS

SPACE vocabulary check-up

A few frequently used space terms are shown in column A below. How many of them do you know the meaning of? Test yourself by matching the definitions in column B with the appropriate words in column A. (Correct answers are on page 18).

A	B
1. Amplidyne	a. An angular displacement about an axis parallel to the normal axis of a missile.
2. Apogee	b. An optical instrument for measuring horizontal angles with precision.
3. Coriolis Effect	c. The complete measuring, transmitting, and receiving for remotely indicating, recording, and/or integrating information.
4. Gyrotron	d. A compressorless jet propulsion device which depends for its operation on air compression, accomplished by the forward motion of the unit.
5. Mach Number	e. Lowest point in a trajectory.
6. Perigee	f. The ratio of the velocity of a body to that of sound in the medium being considered.
7. Ramjet	g. The highest point in a trajectory.
8. Telemetry	h. A special form of D.C. generator particularly useful in servomechanisms.
9. Theodolite	i. The deflection of a body in motion due to the earth's rotation, diverting horizontal motions to the right in the northern hemisphere and to the left in the southern hemisphere.
10. Yaw	j. A form of mechanical oscillator which uses a tuning fork principle of oscillation, used in lieu of a gyroscope in some instances for rate indications.

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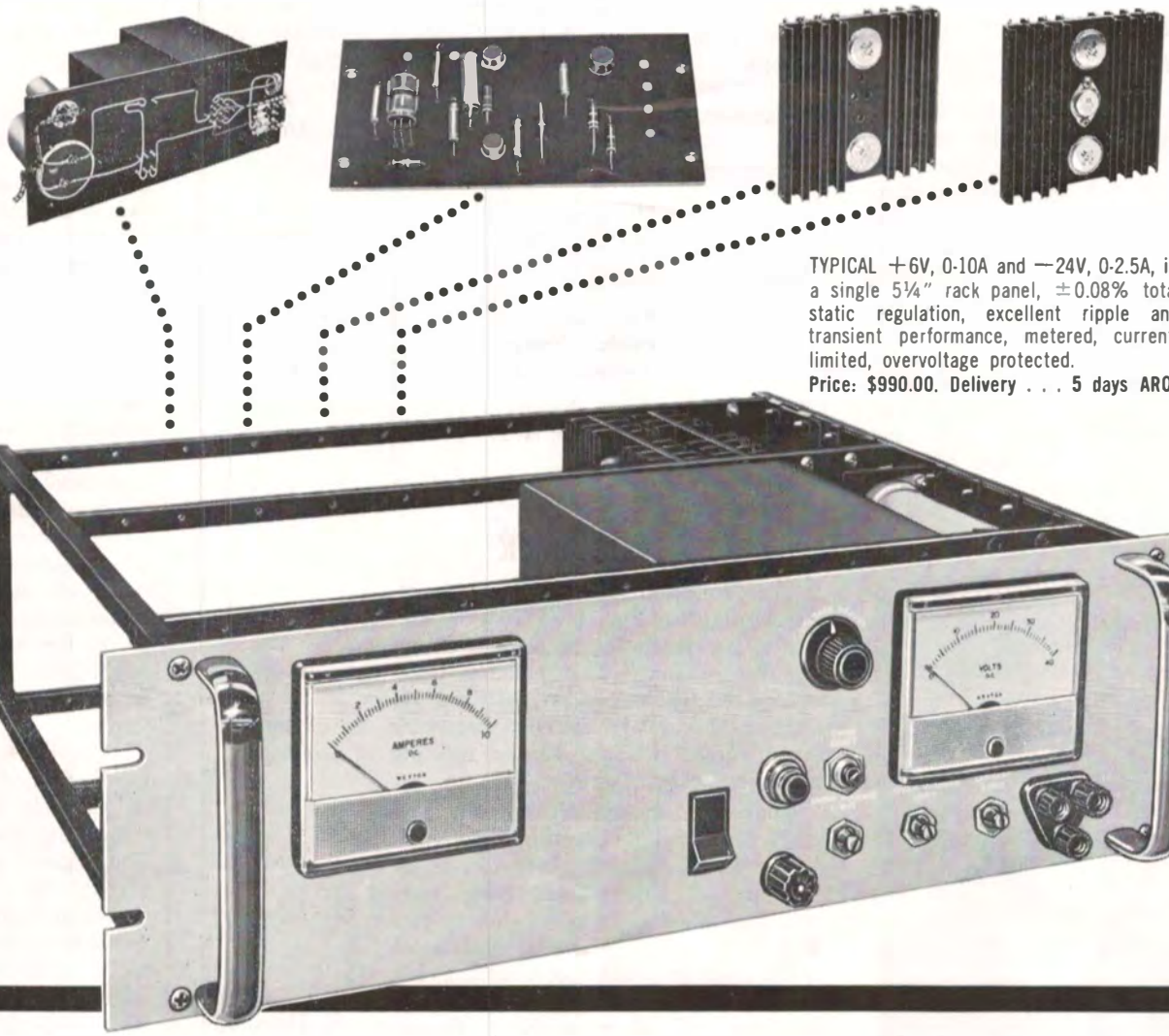

TYPICAL +6V, 0-10A and −24V, 0-2.5A, in a single 5¼" rack panel, ±0.08% total static regulation, excellent ripple and transient performance, metered, current-limited, overvoltage protected.
Price: $990.00. Delivery . . . 5 days ARO!

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Proven circuitry, MIL transformers and chokes, generous derating, thoroughly tested. Full complement of optional over-current, overvoltage, and programming features, including constant-current. Thousands of voltage-current combinations available, up to 30V and 30A. Other ranges, special packaging and full MIL conformance are also available on rapid, dependable delivery schedules.

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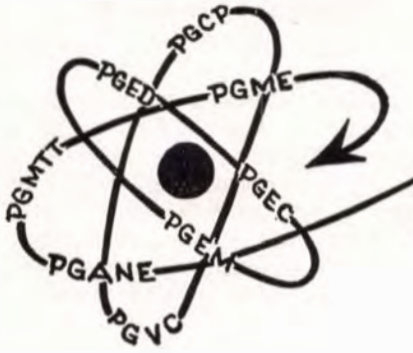

Around the PG Circuit

By GUNTHER "GUS" KARGER

The NEW YEAR has arrived and it is once more time to contact Lloyds of London for insurance against NOT ATTENDING ANY MEETINGS THIS YEAR. I urge you to pay your premiums now and all VEHICULAR and RELIABLE engineers have a chance to do so at the door when they attend their respective meetings this month.

VEHICULAR COMMUNICATIONS MOVE THROUGH THE SPECTRUM — DEMONSTRATION

The local chapter of the PGVC will meet on January 23 to hear Mr. Edward F. Feldman of Panoramic Electronics discuss and demonstrate, with appropriate equipment, "FREQUENCY ANALYSIS OF MOBILE COMMUNICATIONS SIGNALS."

To understand the nature of narrowband FM signals requires careful attention to definition of signal parameters such as modulation index, signal bandwidth deviation, carrier frequency, instantaneous frequency etc. Once terms are established, it is easier to discuss interference susceptibility, abnormalities such as odd order and even order distortion, nonlinear deviations, spectrum utilization, AM and PM on FM, and instantaneous splatter vs frequency deviation.

Many transmitter signal measurements are facilitated by spectrum analysis. Among typical measurements are deviation calibrations, parasites, in-band and out-of-band distortion, and spotting of malfunctions. Statutory requirements covering transmitted signals as well as special problems encountered at extremely high frequencies will also be discussed.

Mobile communications face even more stringent interference problems. Measurement and location of interference, determination of dynamic spectrum occupancy, contraband radiations and band monitoring will be discussed.

Many of the points covered will be illustrated by using laboratory signal

(Continued on Page 10)

PG CALENDAR OF EVENTS

JANUARY 23
8:00 P.M.
FREQUENCY ANALYSIS OF MOBILE COMMUNICATIONS SIGNALS.
PGVC
New York Central Railroad
General Office
Room 1315
466 Lexington Ave. (at 45th St.)
New York

PRE-MEETING DINNER
6:00 P.M.
Stouffers Restaurant
Pershing Square
42nd St. and Park Avenue

JANUARY 15
7:30 P.M.
THE AVAILABILITY OF A SYSTEM AS A SEQUENTIAL TEST PARAMETER
PGRQC
Burroughs Corporation
215 Park Avenue South
New York City

Date: January 18, 1962
Time: 7:30 P.M.
Place: ITT Auditorium
Nutley, New Jersey
Subject: Dr. I. P. Kaminow
Bell Telephone Laboratories
Speaker: Microwave Modulation of Light by the Electro-Optic Effect.

PG ON BIOMEDICAL ELECTRONICS.

Date: January 16, 1962
Time: 8:00 P.M.
Place: Welsh Hall
Rockefeller Institute
68th Street & York Avenue
New York, New York
Subject: Problems and Prospects in Computer Diagnosis.
Speaker: Ralph Engle, M.D.
Associate Professor of Medicine
Cornell University Medical Center
Pre-Meeting Dinner: Sutton Restaurant
1063 First Avenue
New York, New York
6:15 P.M.

PG ON AEROSPACE AND NAVIGATIONAL ELECTRONICS.

Date: January 11, 1962
Time: 8:00 P.M.
Place: Wilkie Memorial Building
20 West 40th Street
New York, New York
Subject: New Types of Inertial Sensors and Aerospace Navigation and Guidance.
Speaker: Dr. Bernard Lichtenstein of the Kearfott Division, General Precision Corp.
Pre-Meeting Dinner: Old Seidelburg
626 Third Avenue
New York, New York
6:00 P.M.

(Continued from Page 9)

sources and a radio frequency spectrum analyzer.

Mr. Edward F. Feldman, who presently is manager, Applications Engineering of Panoramic Electronics, Inc., Mount Vernon, N. Y., received the BEE from Cooper Union in 1949 and the MEE from Polytechnic Institute of Brooklyn in 1956 and is currently pursuing further postgraduate studies at Columbia University.

Prior to joining Panoramic in 1951, he was associated with the New York City Board of Transportation.

He has been active in the development of automatic test instrumentation such as spectrum analyzers, sweep frequency generators, FM/FM telemetry calibration equipment, and several special purpose military systems. He holds and has pending several patents in these fields, and is the author of several technical papers.

Mr. Feldman, a senior member of the IRE also holds membership in the Tau Beta Pi, Sigma and Eta Kappa Nu honorary societies.

Mr. Victor J. Nexon, Chairman of the Chapter has asked me to stress that this subject should be of paramount importance to communication engineers of all categories as the presentation applies to frequencies from the VHF through the Microwave bands.

RELIABILITY AND QUALITY CONTROL

Mr. Victor Selman of the Metropolitan PGRQC Chapter wishes to announce that his group will meet on Monday, January 15, to hear Mr. John H. Bailey of IBM speak on "THE AVAILABILITY OF A SYSTEM AS A SEQUENTIAL TEST PARAMETER."

Special reliability numbers have begun to appear more frequently in producer-consumer contracts, both in military and commercial applications. The primary reason for this impetus has been the tremendous stress placed upon reliability by the military agencies. Firm, contractual, reliability numbers, however, focus the need for improved methods to reduce the high costs and lengthy test times for "successful" demonstration of reliability. By successful is meant that both the producer and consumer have adequate protection that the proposed test plan will not be unjustly unfavorable to their interests more than a specified small percentage of the time.

Heretofore, variations of the Wald Sequential ratio test plans have been used to confirm the mean time between failure for systems without repair. But with continuously-working, repairable

(Continued on Page 12)

Northern New Jersey Section

PRESENTS

1962 SPRING LECTURE SERIES

MANAGEMENT FOR THE ENGINEER

"Decision Making - - - Principles and Applications to Engineering Projects"

THE SUBJECT

Mr. Thompson believes there is a science of management just as there is a science of engineering. The series will encourage the integration of the engineer into management. A management simulation exercise to demonstrate the development and application of decision-making principles will be given. Also to be given is the demonstration of an operations research problem. Management of an engineering project and the place of PERT, the acronym for program evaluation and review techniques, in this problem will be considered. The concluding thought of the series will concern the engineer's place in fulfilling management's purpose.

A certificate will be awarded to all satisfactorily completing the series.

LECTURER: **Robert E. Thompson**
Supervisor of Management Analysis
Reaction Motors Division
Thiokol Chemical Corporation

DATES: **February 8th & 15th**
March 1st, 8th, 15th & 22nd

TIME: **8 P.M.**

PLACE: **Grove Street School**
Grove Street
Montclair, New Jersey

THE SPEAKER

Robert E. Thompson is Supervisor of Management Analysis for the Reaction Motors Division of Thiokol Chemical Corporation. He is responsible for business system computer applications, management information systems, and of the development of teaching techniques including business simulation, organization analysis and PERT. Previously he held various management positions at the Reaction Motors Division. He was an Industrial Engineer at the Continental Can Company, and served as a production foreman, then as a time study engineer at Proctor and Gamble.

He received an industrial engineering degree from Virginia Polytechnic Institute in 1949. He has taught courses in industrial engineering and management decision making and has lectured widely on PERT.

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MANAGEMENT FOR THE ENGINEER

Please reserve ..... tickets for six lectures beginning February 8, 1962.

Enclosed is $..... Name ..... Address .....

.....

Please check appropriate boxes below.

- ☐ Member (IRE or AIEE) .....$ 8.00
- ☐ Non-member $10.00
- ☐ Student member (IRE or AIEE) 2.00
- ☐ Stamped, self-addressed envelope enclosed.
- ☐ Will pick up tickets at first meeting

Make checks payable to NNJ IRE section.

Please address all mail concerning lecture series to:

Mr. C. W. Vadersen
ITT Communication Systems
S. 60 Route 17
Paramus, N. J.

(Continued from Page 10)

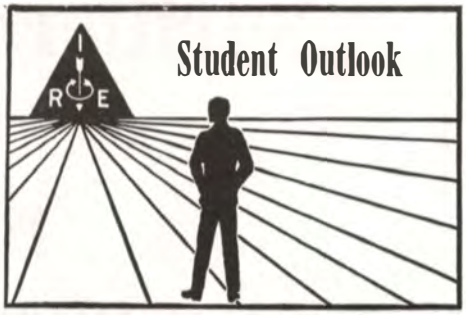
systems, a more meaningful definition of Reliability is Availability, which depends on both the mean time between failure and mean time to repair parameters. Mr. Bailey discusses the construction of a basic sequential test plan for system availability, its implications, and advantages of using this method.

Mr. John H. Bailey received his B.S. degree in mathematics from the University of Rhode Island in June, 1955 and the M.S. degree in mathematics from the University of Utah in 1957. He then completed two years of study toward his Ph.D. degree in mathematical statistics at the University of North Carolina.

Mr. Bailey joined IBM in October, 1959. He is now engaged in the development of applications of statistical techniques to engineering and reliability problems. He has participated actively in design of experiments, teaching statistics and setting up a statistical curriculum. In addition, he has completed several technical papers concerned with estimating system reliability from short term tests.

His memberships include: The Institute of Mathematical Statistics, American Statistical Association, Mathematical Association of America.

The Chapter stresses that non-members are invited.



By BERNARD MEYER

STUDENT ACTIVITIES DAY SET FOR MAY 5

The Metropolitan Joint Student Council AIEE-IRE has decided to hold their Student Activities Day on May 5, 1962. The host college for this event has not as yet been selected.

Student Affairs

Newark College of Engineering

George Bradford of Elastic Stop Nut Corp. spoke on "Application and Usage of Solid State Material."

Stevens Institute of Technology

Joseph Reddington of Computer Control Company spoke on "Input-Output Devices for Computers."

For December, the section has planned the following:

December 2, Metropolitan Joint Student Council Meeting in Burchard Conference Room.

December 13, three films from Raytheon Company: Electronic Skyways; Ready for Sea; Safe Passage.

Student To Professional

The NY Section of the AIEE is launching a new program to sustain interest in Student Branch Activities. This will attempt to let the student know what he can expect when he starts working and in turn what his new employer will expect from him. Dan Sullivan is the Chairman of the newly formed Student Branch Relations Committee.

The schedule calls for about a one hour's duration program, probably set for a lunch hour or some other time that will not conflict with normal school activities. There is a panel, made up of former students who have been in the field from two to eight years and still are aware of their transition from student to professional. In addition, there are previously submitted written questions, as well as questions from the floor.

Notices for students and student affairs should be sent to:

Bernard Meyer
160 Prospect Street
East Orange, N. J.

MICROWAVE VARIABLE ATTENUATORS AND MODULATORS USING PIN DIODES

The NNJ Chapter of PGMTT will have Mr. J. K. Hunton speak to the membership about PIN diodes in microwave variable attenuators and modulators.

The PIN diode is a double diffused junction with an intrinsic layer separating the P & N regions. At frequencies above 100 Mc, the diode ceases to be a rectifier because of carrier storage and transit time effects. Its capacitance is quite small because of the separation of the P & N regions by the I layer. Conductivity of the I region can be varied by a d.c. bias current and the device becomes an electrically variable resistor which can be used for microwave attenuators and modulators up to frequencies as high as 20 gc.

The PIN junctions are mounted on posts which are inserted in a 50 ohm strip transmission line as shunt elements, and a number of these elements, spaced ¼ wavelength apart at mid-band, are used to form an attenuator.

At the appropriate bias current, yielding 50 ohm junction resistances, the diode elements are reactively compensated by choice of post dimensions so that they are effectively pure resistances, yielding an image attenuation of 4.2 db per element. Many elements can be used to attain any desired total attenuation and higher impedance end elements can be used to improve the SWR. Bandwidths of 4 to 1 with low SWR in both ON and OFF conditions are achievable.

Maximum attenuation of 60 db, insertion loss of 1 db, and SWR of 1.5 are typical for a 12 diode attenuator, and powers of the order of watts can be handled with negligible harmonic generation. When used as a pulse modulator, rise times of the order of 10 nano-sec. are typical.

JAMES K. HUNTON

James Keith Hunton (SM '57) was born in Montreal, Canada on December 20, 1921. He received the B.A. Sc. degree in Engineering Physics from the University of Toronto, Canada in 1942 and served in the Royal Navy as a radar officer until 1946. He attended Massachusetts Institute of Technology where he was an instructor in electrical engineering and received the S.M. degree in 1948. At this time he joined the Hewlett-Packard Company in Palo Alto, California where he is now Manager of the Microwave Components Development Section.

MEETING FACTS

SPEAKER . . .	J. K. Hunton Hewlett-Packard Company Palo Alto, California
WHEN . . .	8 P.M., Wednesday, January 17
WHERE . . .	Hillside School, Montclair, N. J.
DINNER . . .	6 P.M., Three Crowns Restaurant, Montclair, N. J.

A MESSAGE TO MEMBERS

Xvxn though my typxwritxr is an old modxl, it works quitx wxll xxcxpt for onx of thx kxys. I havx wishxd many timxs that it workxd pxrfxctly. Thxrx arx 46 kxys that function wxll xnough, but just onx kxy not working makxs thx diffxrxncx.

Somxtimxs it sxxms to mx that a profxssional socixty is somxwhat likx my typxwritxr — not all thx kxy pxoplx arx working propxrly. You may say to yoursxlf, "I am only onx pxrson; I won't makx or brxak a program." But it doxs makx a diffxrxncx bxcausx a socixty program to bx xffxctivx nxxds thx participation of xvxry mxmbxr.

So thx nxxt timx you think you arx only onx pxrson and that your xfforts arx not nxxdxd, rxmxmbxr my typxwritxr and say to yourslf, "I'm a kxy pxrson in our organization and am nxxdxd vxry much."

Russ Parxnt
STWP NXWSLXTTXR

MACHINES THAT LEARN

Prepared for the Northern New Jersey Newsletter

by George D. Hulst

The August 1960 issue of "Automatic Control" carried a series of articles on this interesting subject. The topic with which the several types of machines were to familiarize themselves was, appropriately enough, the English alphabet. Several approaches to this topic have been tried over the years, involving varying degrees of complication and meeting with varying degrees of success.

Of particular interest to this writer was the uninhibited approach of Dr. Frank Rosenblatt of the Cornell Aeronautical Laboratory. He calls his machine the Mark I Perception. It derives its functional pattern from what is known about the operation of the central nervous system of higher animals. His machine is simple in concept but purposely uses redundancy of equipment. The unique feature is that Dr. Rosenblatt's machine uses absolutely no prior programming or specific design. Without any physical changes his machine can be either taught or brainwashed by an unskilled teacher.

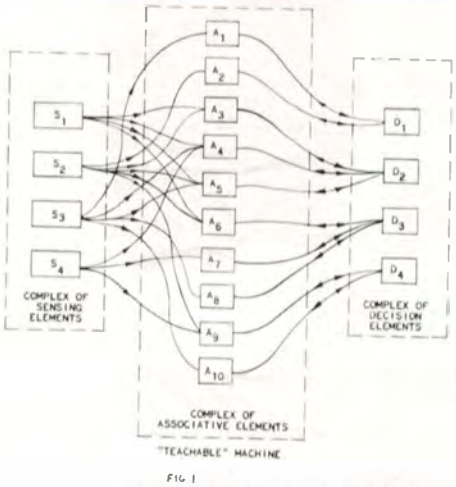


FIG 1

The functioning portions of Dr. Rosenblatt's machine comprise a medium-sized complex of sensing elements, a more extensive complex of associative elements and a relatively limited array of decision elements with interconnecting wires. (See Figure 1.) All that is required of the teacher is to register either pleasure or displeasure at the results.

The wiring between the sensing elements and the associative elements is random: Some are connected and some are not. I know a couple of wiremen who have a special talent in this direction. It should be pointed out, however, that Dr. Rosenblatt's machine will be bothered as much as any other equipment by cold-solder joints.

The wiring between the associative elements and the decision complex is also random. About 20 associative elements are connected to each decision element. In this case the connection is bi-directional in a manner which incorporates in the feedback path either the pleasure or the displeasure of the teacher at the decision which the machine has made. The decision complex includes an indicator which lets the teacher know what the machine's decision is.

In the application of the machine that is described, the sensing element complex comprises 400 photocells arranged in a two-dimensional array. The stimulus to the system comprises letters of the English alphabet shown on a display board in random sequence, which the machine is taught to recognize. In its untrained or brainwashed condition, the machine identifies the letters in unpredictable or "idiot" fashion. It is just as apt to say, for instance, that the letter A is the eighth letter of the alphabet, or the thirteenth.

At this point the teacher takes over. If the machine says that A is the eighth letter, the teacher registers displeasure. He can do this by pushing a disapproval button if he wishes. I would suggest that the teacher might get more satisfaction from his job if Dr. Rosenblatt would rig up a small microphone to register and distinguish the teacher's purr of satisfaction from his snarl. Whatever form his disapproval takes, it is transmitted back in the feedback path from the particular decision element that was favored to the particular associative elements to which it is connected. These latter are each equipped with little motors on volume-control shafts, and thus are capable of becoming somewhat less productive than before each time disapproval occurs. In other words it can become discouraged, even as you and I.

As a result of this action, the balance of the several associative elements connected to any one decision element will be altered. The next time the letter A is shown, the machine will decide that A is probably some other letter. Eventually, after a few tries, the machine will come up with the right answer. The teacher then had better register his approval, or the machine will never learn at all.

The application of learning machines are both immediate and far-reaching. The output of identified letters can be directed, for instance, into an electric typewriter. The stimulus could be a document which needs retyping. After a brainwashing process in which the teacher repeatedly denies that what the machine has learned is true, the machine can equally well be taught to recognize some other alphabet, such as Sanskrit.

Alternately, instead of using sensors which react to visual stimuli, the input to the machine could be spoken letters of the alphabet. The sensing complex in this case would comprise a microphone, with the different sensing elements placed at random in a network of discriminatory filters. This configuration follows closely the existing mechanism of the human ear.

By adding sufficient associative elements in parallel, the recognition of handwriting can be accomplished. So also can be the automatic translation of languages, the automatic diagnosing of ailments from described symptoms, the predicting of actions of a political

(Continued from Page 17)

tyranny, and so forth. The possibilities exceed the limits of the imagination.

We have come a long way in so-called electronic brains since the days when the ENIAC of the Moore School at the University of Pennsylvania was put to work during World War II computing the behavior of artillery projectiles. The ENIAC, which was a miracle of its day, worked a single problem set up over a period of months by a corps of experts of interconnecting patchboards, using a prearranged rigid computational timetable and consulting, when necessary, an inflexible prebuilt function table.

Since the days of the ENIAC the advances in the technology of electronic computers have been many and marvelous. Tubes have yielded to transistors, to core matrices, and to magnetic drums. The new computing equipment is more compact, more efficient, more reliable, and more flexible than before. Throughout this progress, however, the major bottleneck in time and talent has been that of setting up the machines: the so-called programming. In the musical sense of the word, we have had to literally teach them the score.

With the advent of machines that can easily be taught, mankind's capability of using the tools in his automatic machinery toolkit will be vastly increased. We therefore can expect a new major revolution in the use of machine technology, coming as it does immediately on the heels of several preceding revolutions.

Each successive advance in technology has brought with it prophets of both hope and gloom. Periods of rapid social readjustment have always brought with them to mankind both disaster and opportunity. At a time of accomplishment there is always a temptation to self-pride and complacency which has been associated in the minds of some with the disasters that followed. It is perhaps appropriate, therefore, in contemplating the impact of a new technology, to attend once more the timely forecast of the prophet Isaiah:

"They worship the work of their own hands:
That which their own fingers have made.
The lofty looks of men shall be humbled;
And the haughtiness of men shall be bowed down;
And the Lord alone shall be exalted."

Isaiah 2: 8-11

Answers to Space Vocabulary Check-up on page 7.

1.	h.	6.	e.
2.	g.	7.	d.
3.	i.	8.	c.
4.	j.	9.	b.
5.	f.	10.	a.

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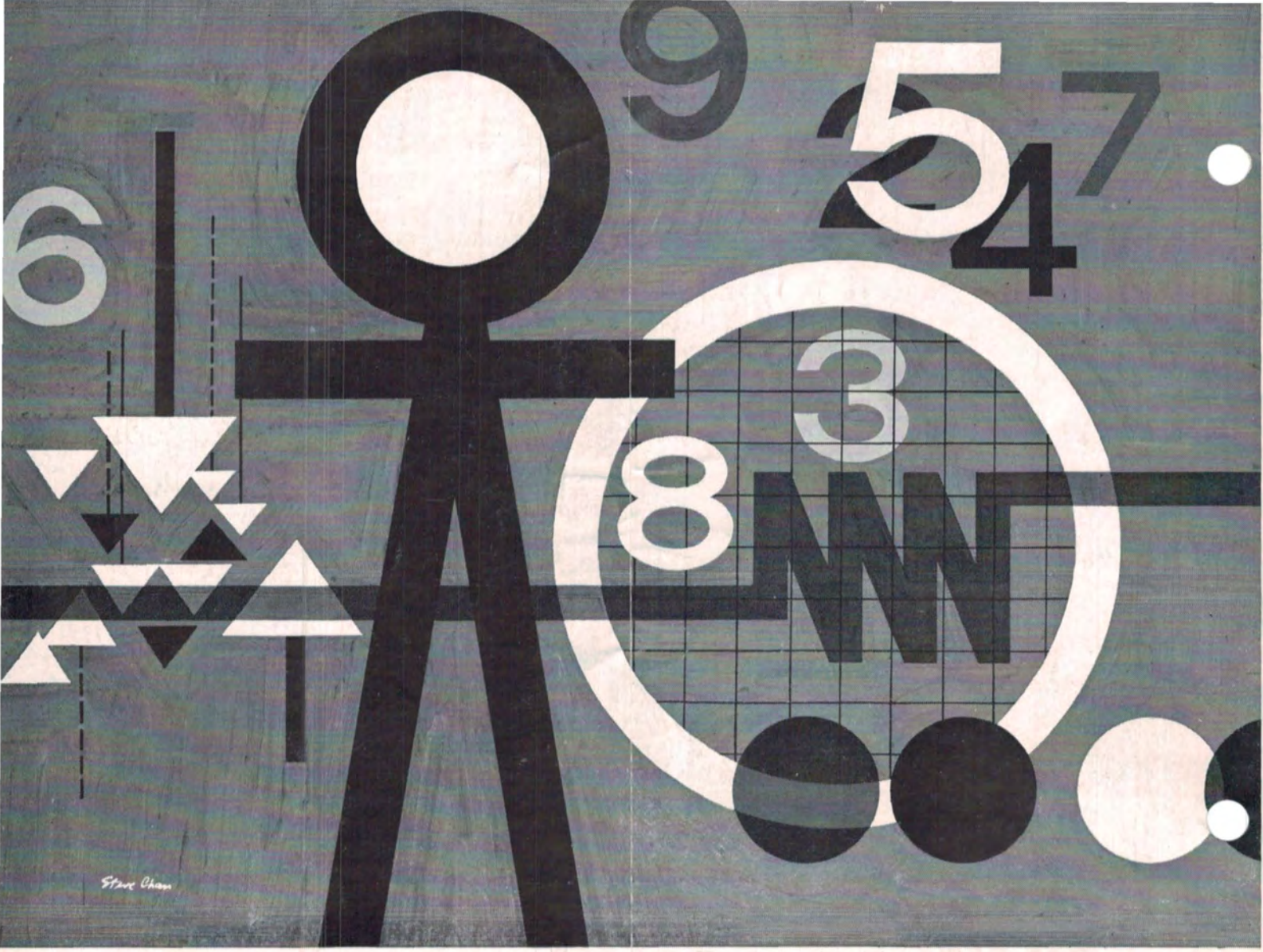

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