

# Color Perception

By Dr. Mauro N. Zambuto

*Biographies of Executive Committee Nominees, page 6*



The IEEE

## Newsletter

The Magazine of the North Jersey Section

**SECTION MEETING—AUTOMATIC CONTROL GROUP**  
**April 28 — 8 P.M.**

Arnold Auditorium      Bell Telephone Labs  
 Murray Hill, N. J.

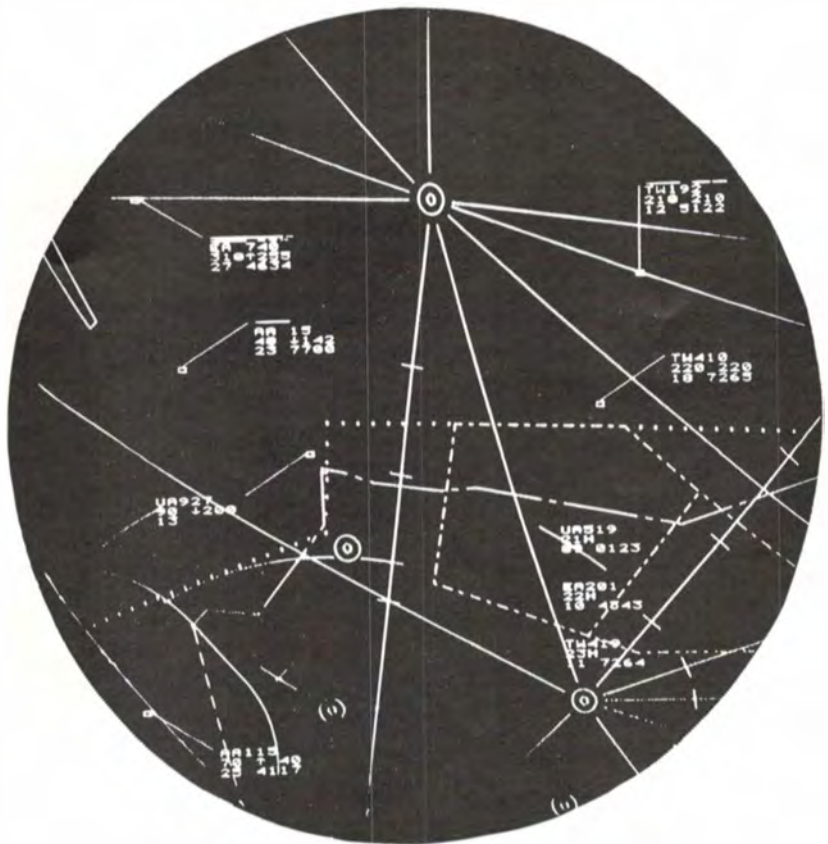
Pre-Meeting Dinner — 6:00 P.M.      Wally's Tavern

*For details, see page 5*

Volume 12 / Number 8

APRIL 1966

# There's more to Air Traffic Control than meets the eye.



Everyone will recognize this controller's scope.

But unless you're a Hazeltine engineer or an FAA employee you may not know that our Alpha-Numeric Generator is in the back room converting computer data into the symbols, characters, lines and vectors on the scope.

Our ANG is an important improvement in air traffic control—the positive association of aircraft identity and altitude information with the aircraft targets shown on radar displays. It is the latest of a long-line of Hazeltine contributions.

## **RADAR SYSTEMS RESEARCH**

Study of systems using advanced pulse compression, research in multi-dimensional radar resolution, space object identification, ultra-high resolution systems. Experience in radar systems analysis and hardware Implications desirable.

## **ADVANCED COMMUNICATIONS RESEARCH**

Synthesis and advanced development of ECCM communications, navigation and IFF, including AJ, secure and concealed systems. Strong theoretical background with substantial experience in analysis and/or synthesis required. Additional background in circuit design and hardware development desirable.

## **SIGNAL PROCESSING RESEARCH**

Investigation of problems in advanced pulse compression waveforms and signal processing, optimum filtering, multi-static radar data association. Both experimental and analytical backgrounds desirable.

## **CIRCUIT DESIGN**

BS in EE (MS preferred) with 2 or more years experience in the design and development of solid state circuitry for military electronics sys-

tems. Assignments in diversified programs working from specification to prototype.

We'd like to chat with you about it and similar projects across a desk. Particularly our IFF Systems, Radar Systems and Displays, ASW and Sonar Systems, Data Processing Systems and Spacecraft Imaging Devices.

If you like working in small groups on large electronic problems where unconventional approaches are called for, we have new openings now at Greenlawn, Little Neck, and Plainview, Long Island.

tems. Assignments in diversified programs working from specification to prototype.

## **SYSTEMS ENGINEERING**

Graduate EE required with several years experience in design of military systems involving RF, data processing and display components. Background in logic or equipment design and familiarity with MIL specs desirable.

## **RADAR ENGINEERING**

Senior openings in Radar and ECM Systems design. Intermediate and junior openings in RF and IF solid state circuit design. Junior openings in general solid state circuit design.

## **FIELD ENGINEERING**

Engineering representative at field sites where Hazeltine equipment is installed. BS in EE or Physics required, with one or more years practical experience in installation, maintenance or servicing electronic systems and equipment. Military experience in electronics preferred.

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Write in confidence to Mr. W. A. Speer



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#### ABOUT ADDRESS CHANGES

REPORT ALL ADDRESS CHANGES TO:  
INSTITUTE OF ELECTRICAL AND ELECTRONICS  
ENGINEERS INC., 345 EAST 47th STREET  
NEW YORK, N. Y. 10017

It is not necessary to inform the North Jersey Section when you change your mailing address. The NEWSLETTER and other section mailings use a list provided by IEEE's national headquarters in New York. This means the Section has no need to maintain a mailing list or addressing plates. Section membership records are changed when Headquarters notifies us.

#### NEWSLETTER STAFF

Editor: Sam Petrokofsky  
IEEE Group Editor: A. R. D'heedene  
School Affairs Editor: Gene R. O'Brien  
Associate Editor: David Wiener  
Associate Editor: Fred T. Grampp  
Advertising Manager: M. M. Perugini

**Executive Committee Meeting**  
at Verona Public Library — May 4

#### North Jersey Section IEEE Executive Committee

##### Section Officers

Chairman ..... Walter L. Glomb  
Vice Chairman ..... Stephen A. Mallard  
Treasurer ..... James W. Gordon  
Secretary ..... Joseph O'Grady  
Member-at-Large ..... Bernard Meyer  
Member-at-Large ..... Herbert Blaicher, Jr.  
Past Chairman ..... John K. Redmon

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Education ..... Earl Van Tassel  
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Procedures ..... Frank Polkinghorn  
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Nominations ..... A. G. Kandoian  
Program ..... M. Irvine  
Publications ..... Marcel Kozuch  
Publicity ..... Harry Raven  
Student Affairs ..... J. W. Earle  
Group Coordinator ..... D. R. Campbell

## Stevens Institute of Technology

### IEEE Basic Sciences — Electronic Computers

#### SYMPOSIUM — COMPUTER AIDED BASIC RESEARCH

Date: Friday, April 22, 1966  
Time: 9:30 A.M. - 5:00 P.M.  
Place: Stevens Institute  
Hoboken, New Jersey  
Cost: Regular \$10; students \$5  
(includes lunch, preprints)

Papers presented by prominent researchers in socially oriented disciplines will be discussed by an authoritative panel and the audience. The attendees will be furnished preprints of the papers to be given before the conference. The speakers will review and summarize their paper in a short exposition. A panel of half a dozen or so specialists in

author's field, associated fields or computers will interrogate the speaker and make additional comments. The audience will address comments and questions to the panel or the speaker.

Speakers include: Computers—Ivan Flores, Stevens; Biology—Warren McCulloch, MIT; Psychology—Ward Edwards, U. of Michigan; Sociology—Philip Stone, Harvard; Philosophy—Fred Fitch, Yale; Music—John Pierce, Bell Labs.

For information, registration and preprints apply to: Dr. Ivan Flores, EE Dept., Stevens Institute, Hoboken, N. J. 07030.

## CALENDAR

### Tuesday, April 19

#### N. Y. COMTEC GROUP

6:30 P.M.—“Communications Transmission, Part III Design Applications of Wideband Data Systems”  
T. L. Leming, Director of Telecommunications Engineering  
Collins Radio Corp.

At Western Union auditorium, 160 West Broadway, N. Y. C.

#### N. Y. COMPUTER GROUP

7:30 P.M.—“Panel To Debate Deficiencies In Area's Computer Education”  
Prof. Ted Bashkow, Columbia University  
Edward Shanken, Engineers' Joint Council  
George Kaye, IBM

At Burroughs Corp. auditorium, 605 Third Ave. at 40th St., N. Y. C.

#### NORTH JERSEY COMTEC GROUP

8:00 P.M.—“Expanding Cable Communications”  
F. T. Andrews, Jr., Bell Telephone Labs.  
At Communication Systems, Inc., Paramus, N. J.

### Wednesday, April 20

#### NORTH JERSEY GMTT

8:30 P.M.—“Fundamentals of Holography”  
Dr. Herwig Kogelnik  
At Bell Telephone Labs., Arnold Auditorium, Murray Hill, N. J.

### Thursday, April 21

#### N. Y. POWER & INDUSTRIAL

2:00 P.M.—“Inspection Trip to Bell Telephone Labs”  
For tickets contact R. A. Martinson, L. I. Lighting Co., Hicksville, N. Y.  
At Bell Telephone Labs., Murray Hill, N. J.

#### NORTH JERSEY POWER GROUP

6:30 P.M.—“Lightning Protection”  
Round table discussion and election of officers  
At Public Service Terminal Bldg., Room 3171A, 80 Park Place, Newark, N. J.

#### N. Y. ENGINEERING MANAGEMENT GROUP

7:30 P.M.—“Papers On Engineering Management Topics”  
Dr. S. S. Stephenson, L.I.U.; Dr. A. Easton, Columbia U.  
N. Slurzburg, ITT; L. Katz, N. Y. Telephone Co.  
At United Engineering Center, Room 125, 345 East 47th St., N. Y. C.

### Friday, April 22

#### NORTH JERSEY SYMPOSIUM

9:30 A.M. to 5:00 P.M.—“Electron Computers IEEE Basic Sciences — Computer Aided Basic Research”  
Apply to Dr. Ivan Flores, EE Dept., Stevens Institute  
At Stevens Institute, Hoboken, N. J.

### Thursday, April 28

#### N. Y. COMTEC GROUP

9:30 A.M.—“Inspection Trip to N. J. Bell Telephone Co.  
Electronic Switching Exchange”  
Contact F. E. Sellinger, ADT Co., Inc., 155 Sixth Ave., N. Y. C.  
At N. J. Bell Telephone Co. Electronic Switching Exchange, Succasunna, N. J.

#### NORTH JERSEY SECTION MEETING AUTOMATIC CONTROL GROUP SPONSORED

8:00 P.M.—“Subjective Color Perception By The Adapted Eye”  
Dr. Mauro H. Zambuto  
At Arnold Auditorium, Bell Telephone Labs., Murray Hill, N. J.

### Wednesday, May 18

#### N. Y. POWER & INDUSTRIAL

6:00 P.M.—“1966 Spring Get-to-Gether — Flatfoot's Frolics”  
Contact Andy Massarella, Con Ed. of N. Y., 4 Irving Pl., N. Y. C.  
At 165th Regiment Armory, Lexington Ave. between 25th & 26th St., N. Y. C.

# Ballantine Precision True-RMS Voltmeter

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**Accuracy** . . . . . 1/4 %, 100 Hz to 10 kHz,  
0.1 V to 300 V; 1/2 %, 50-100 Hz and  
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249 Terhune Ave., Passaic, N. J.

## NORTH JERSEY POWER GROUP LIGHTNING PROTECTION

Date: April 21, 1966

Time: 6:30 P.M.

Place: Room 3171A  
Public Service Terminal Building  
80 Park Place  
Newark, New Jersey

A round table discussion will cover the latest techniques in lightning protection of distribution lines, equipment and underground cables. Arrangements have been made to have knowledgeable manufacturers, utility and consultants technical representatives participate in the discussion.

Since this will be the last meeting of the Power Chapter until Fall, election of officers will be held. All chapter members are urged to attend and bring their associates.

## N. Y. COMTEC GROUP

### INSPECTION TRIP TO NEW JERSEY BELL TELEPHONE COMPANY ELECTRONIC SWITCHING EXCHANGE

This morning's trip will be to the New Jersey Bell Telephone Company's Electronic Switching Exchange, at Succasunna, New Jersey, to inspect the No. 1 Electronic Switching System (ESS).

Attendance is limited to 40 persons and is by advance registration only. Transportation will be made available by Chartered Bus, leaving 43rd St. & Vanderbilt Avenue, New York, at 9:30 A.M., Thursday, April 28, 1966. Cost of transportation to be determined by number of people using bus. Return before April 22, 1966.

Mr. F. E. Sellinger, ADT Co., Inc.  
155 Sixth Ave., N. Y., N. Y. 10013

## N. Y. POWER & INDUSTRIAL

### INSPECTION TRIP TO BELL LABS

Time: 2:00 P.M.

Date: Thursday, April 21, 1966

Place: Bell Laboratories  
Mountain Avenue  
Murray Hill, New Jersey

The tour will cover research work in the fields of laser, electronic switching, and cable insulation.

The tour will take about two hours and will be limited to 50 persons, with advance registration required.

A chartered bus will leave New York from in front of Hotel Holland, 321 West 42nd Street (between 8th & 9th Avenues) at 12:30 P.M. and should return by 6:00 P.M. Round trip fare is \$2.00.

Request for tickets should be made to:

R. A. Martinson, I. I. Lighting Company  
175 E. Old Country Rd., Hicksville, N. Y.

Make checks payable to Power & Industrial Division, New York Section IEEE. No request will be considered after April 18, 1966.



## NORTH JERSEY SECTION MEETING

SPONSORED BY THE  
AUTOMATIC CONTROL GROUP

### Subjective Color Perception By The Adapted Eye

**Speaker:** Dr. Mauro H. Zambuto  
**Date:** Thursday April 28, 1966  
**Time:** 8:00 P.M.  
**Place:** Arnold Auditorium  
Bell Telephone Laboratories  
Murray Hill, N. J.  
**Pre-meeting  
Dinner:** Wally's Tavern  
Watchung, N. J.  
6:00 P.M.

The chromatic sensation generated by a light stimulus of given spectral composition depends on the conditions of adaptation of the eye. A mathematical representation of the "subjective (or adaptive) stimuli" is presented as a logical consequence of classical color theory, known psychophysical laws, and recent measurements of eye properties. Support of the validity of the law is presented in the form of several experiments verifying mathematical predictions. Some engineering applications are suggested and described.

#### About the Speaker:

Dr. Mauro Zambuto attended the Universities of Rome and Padua, Italy where he received his doctorate degree. He is currently engaged in laser, quantum electronics, and color perception research. He is Professor of Electrical Engineering at Newark College of Engineering. Dr. Zambuto was formerly, over a period of many years, technical director and manager of motion picture studios in Italy and the U.S.A.

## NORTH JERSEY GMTT FUNDAMENTALS OF HOLOGRAPHY

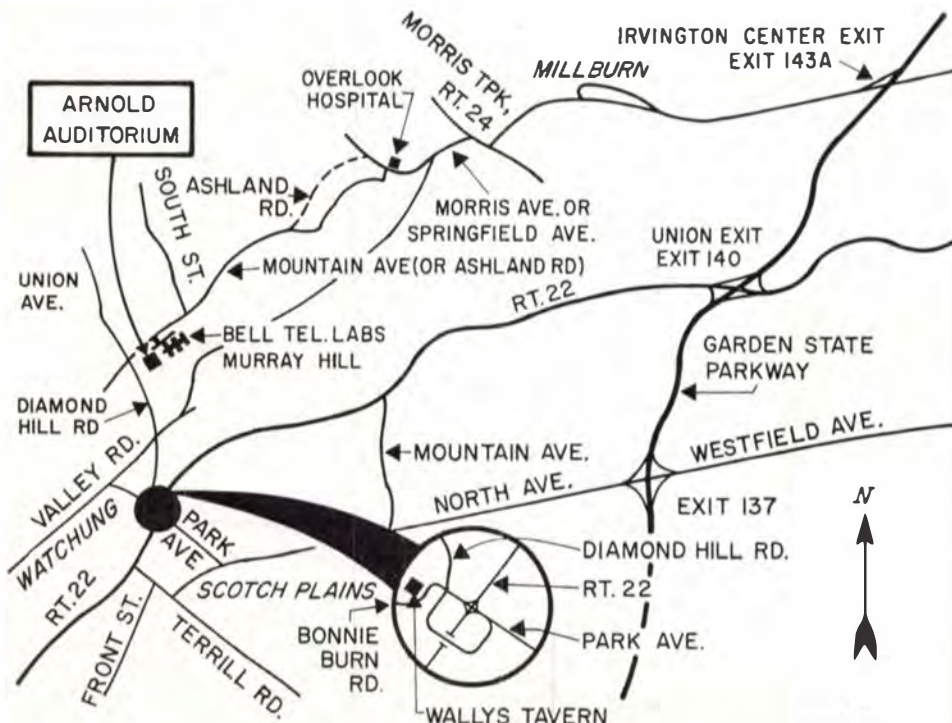
**Date:** Wednesday, April 20,  
1966 at 8:30 P.M.  
**Speaker:** Dr. Herwig Kogelnik  
**Place:** Arnold Auditorium  
Bell Telephone Labs  
Murray Hill, N. J.  
**Pre-meeting Dinner:** 6:30 P.M., Wally's  
Watchung, N. J.

This talk will survey briefly the areas of application of holographic techniques, and discuss the fundamental principles of holography and wavefront reconstruction. Topics to be discussed are: the three-dimensional aspects of wavefront reconstruction; the use of a spatial carrier or reference beam; the effect of thick emulsions; and others. The talk is followed by a demonstration of holograms.

Herwig Kogelnik was born in Graz, Austria. He received the degree of Dipl. Ing. in electronic engineering in 1955 and the Dr. Techn. in 1958, both from the Technische Hochschule, Wien, Austria, and the Dr. phil. in 1960 from Oxford University, England.

From 1955 to 1958 he was Assistant Professor at the Institut für Hochfrequenztechnik in Vienna, engaged in microwave research and teaching. He won a British Council Scholarship to Oxford, 1958 to 1960, where he did research on electromagnetic radiation in magnetoplasmas and anisotropic media. He joined the Electronics Research Department of Bell Telephone Laboratories in 1961 where he has worked on optical masers.

Dr. Kogelnik is a member of the American Physical Society and the Elektrotechnischer Verein Österreichs, Austria.



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**Antenna Laboratory:** Smithtown, N. Y.

### N. Y. COMPUTER GROUP

#### PANEL TO DEBATE DEFICIENCIES IN AREA'S COMPUTER EDUCATION

Officials will discuss the problem at the April 19 meeting of the New York Metropolitan chapter of the Computer Group.

The meeting is scheduled for 7:30 P.M. at the Auditorium of the Burroughs Corp., 605 Third Ave., at 40th St. (Entrance through showroom). The meeting will be preceded by a Dutch-treat dinner at Gatti's Restaurant, 246 E. 40th St., at 5:45.

The panel will include Prof. Ted Bashkow of Columbia, Edward Shanken from the Engineers' Joint Council and George Kaye of IBM.

### N. Y. ENGINEERING MANAGEMENT GROUP

#### PAPERS ON ENGINEERING MANAGEMENT TOPICS

Four papers of current engineering management concern will be delivered at the April 21 meeting of the Engineering Management Group. The meeting, open to all, will be held at 7:30 P.M. in Room 125, United Engineering Center, N. Y. The presentations will highlight the decision-making and long-range planning phases of EM.

### N. Y. POWER & INDUSTRIAL

#### 1966 SPRING GET-TO-GETHER

**Title:** "Flatfoot's Frolics"  
**Date:** May 18, 1966  
**Time:** 6:00 P.M.  
**Place:** 165th Regiment Armory  
Lexington Avenue between  
25th & 26th Streets  
New York City  
**Tickets:** \$5.75  
Andy Mazarella, Room 1341-S  
c/o Consolidated Edison Company  
of New York, Inc.  
4 Irving Place  
New York, N. Y. 10003

Please enclose stamped, self-addressed envelope.



## Executive Committee Nominations — 1966 - 67

The Nominations Committee of the North Jersey Section of the IEEE presents the following slate of officers for 1966-67.

For Chairman — Stephen A. Mallard  
For Vice-Chairman — Bernard Meyer  
For Treasurer — Joseph G. O'Grady  
For Secretary — M. M. Irvine  
For Members-at-Large

R. L. Whittle and  
Herbert Blaicher

Additional nominations may be made by presenting a petition signed by not less than twenty-five (25) voting members of the North Jersey Section to the Executive Committee not later than 1st of May. The petition must certify that the persons nominated have agreed to serve if elected.

Election of Officers will take place at the General Meeting in May unless the Executive Committee decides that a special ballot is required.



Mr. Mallard received his ME from Stevens Institute of Technology in 1948 and his MS from Stevens in 1951. He taught in the Electric Engineering Department at Stevens from 1948 to 1951. Since 1951 he has been employed in various engineering capacities by the Public Service Electric and Gas Company. He is presently the Transmission Planning Engineer of that company.

In addition to being a Senior Member of IEEE, Mr. Mallard is a member of CIGRE (International Conference on Large Electric Systems), Tau Beta Pi, the National Society of Professional Engineers, the Montclair Society of Engineers, the Essex County Grand Jury Association and the Serra Club of Bloomfield.

Mr. Mallard will be attending the CIGRE Conference in Paris in June of this year. He lives in Nutley with his wife and three children: Kevin, a freshman at Iona College; Catherine, a freshman at Marylawn of the Oranges; and Eileen, who is in grade school.



Bernard Meyer received his BA and BEE from New York University in 1942 and 1950 respectively. He has been active in the North Jersey Section of the IRE and IEEE

as Student Affairs Editor, Managing Editor, and Editor of "The Newsletter." He has also served as Chairman of the Publicity Committee and Chairman of the Publications Committee, and is now member-at-large on the Executive Committee.

At present he is employed as an Electronics Engineer at Picatinny Arsenal in the Electrical Inspection Equipment Branch of the Quality Assurance Directorate.



Joseph G. O'Grady is the Assistant Laboratory Engineer at the Maplewood Testing Laboratory of the Public Service Electric and Gas Company. He joined the Company in 1948 and has held various positions in the Electrical Division of the Laboratory and was appointed to his present position in 1964.

He is a graduate of the College of Engineering of New York University where he received a BEE degree in 1954, and is a former member of the Instructing Staff of the Special Courses Division of Newark College of Engineering.

He has been a member of the Section Executive Committee for several years, having been chairman of both the Section Program Committee and the Publicity Committee. In 1965 he was elected Section Secretary.

Mr. O'Grady is a senior member of both IEEE and ISA, and is also a member of Rotary International.



M. M. Irvine, R.D. No. 1, Mendham, New Jersey.

Education: 1950 — B.S. Engineering, Physics, Montana State College; 1952 — M.S. Physics, Lehigh University; 1955 — Ph.D. Physics, Lehigh University.

Memberships: American Physical Society, IEEE, Society of the Sigma Xi, American Association for the Advancement of Science. Board of Directors (3rd Vice Pres.) Morris County Engineer's Club.

Nov. 1943 to Nov. 1946 — Radio Officer U. S. Merchant Marine. 1952-1955 — Instructor in Physics, Lehigh University. 1955 to present — Bell Telephone Laboratories, Whippany, New Jersey.

Presently Head — Tactical and Support Program, Design Department. Oct. 1955 to Nov. 1956 — Worked on Airborne Bombing and Navigation System. Nov. 1956 to March 1958 — DEWLINE Project: System design of a Radar Data Processing System. March 1958 to present — Working on the Data Processing System for the Nike Zeus and Nike-X Systems.

Holds Amateur Radio License K2RNA.



H. E. Blaicher, Jr. was graduated from the Pennsylvania State University in 1949 with a degree of B.S. in Electrical Engineering. Following graduation he entered the

cadet engineer training course of Jersey Central Power & Light Company. Since then he has worked in various assignments in system planning and distribution engineering. He is presently in the System Planning group where he is in charge of engineering computer applications.

Mr. Blaicher served on active duty with the U. S. Armed Forces from 1943 to 1946.

Mr. Blaicher is a senior member in IEEE and has served as chairman of the Education

## NORTH JERSEY COMTEC

### EXPANDING CABLE COMMUNICATIONS

Date: April 19, 1966  
Time: 8:00 P.M.  
Speaker: F. T. Andrews, Jr.  
Bell Telephone Laboratories  
Communication Systems, Inc.  
Paramus, New Jersey

Mr. Andrews will discuss the very important and continuing role of wire and cable communication systems which, unlike the radio spectrum, are unlimited in their ability to grow and meet expanding needs. He will describe the wire and cable systems in major use today, which range from single channel voice frequency transmission over open wire lines, to carrier transmission of as many as 1860 channels on coaxial cables. Future systems providing even larger channel cross-sections and some using pulse transmission techniques will also be described.

Mr. Andrews is Director of the Transmission Systems Engineering Center at the Bell Telephone Laboratories, a position he has held since 1962. His responsibilities include establishing transmission performance and maintenance objectives, engineering voice-frequency transmission equipment, and research in human factors. He joined the Bell Laboratories in 1948 upon graduation from the Pennsylvania State University with the BS degree in Electrical Engineering. He completed the Communications Development Training Program at the Bell Laboratories and his early work was in the field of switching circuits, memory systems, and nonlinear magnetic logic elements. He participated in the development of T1 carrier, the Bell System's first PCM system, prior to assuming his present responsibilities. He is chairman of the IEEE Wire Communication Committee's task force for standardizing testing methods for telephone instruments, and is vice-chairman of CCITT Study Group XII.

### N. Y. COMTEC GROUP COMMUNICATIONS TRANSMISSION

Starting on April 19, the Education Committee will begin Part III "Design Applications of Wideband Data Systems" of its lecture series on Communications Transmission.. The dates and subjects are as follows:

Date	Subject
Apr. 19	Microwave Systems
Apr. 26	Radio propagation and frequency allocation
May 3	Radio systems design
May 10	Pulse Code Modulation
May 17	Pulse Code Modulation
May 24	Wideband Data

Speakers for Part III are as follows:

April 19, 26 and May 3 — T. L. Leming, Director of Telecommunications Engineering, Dallas Division, Collins Radio Corp.

Committee during the 1961-62 season, and as an IEEE representative on the New Jersey Engineer's Committee for student guidance. He is presently chairman of the Power Group Chapter in North Jersey Section, IEEE.

Note: Biography of R. L. Whittle not available at press time.

# New Tektronix Type 556

## DUAL-BEAM DC-to-50 MHz Oscilloscope

*with 10 ns/cm sweep rate on both beams and many new operating and convenience features*



### CHARACTERISTICS

**New Dual-Beam CRT** (with illuminated internal graticule)—provides "zero-parallax" viewing of small spot size and uniform focus over the 8 cm by 10 cm display area.

**Calibrated Sweep Delay**—extends continuously from 0.1 microsecond to 50 seconds, to permit expansion of a selected portion of the sweep.

**Independent Sweep Systems**—provide 24 calibrated steps from 0.1  $\mu$ s/cm to 5 s/cm; the X10 Magnifier extends the fastest sweep rates to 10 ns/cm.

**Single-Sweep Operation**—enables one-shot displays for photography of either normal or delayed sweeps.

**2 Independent Triggering Systems**—provide stable displays over the full bandwidth,

and to beyond 50 MHz. Both vertical amplifiers supply trigger signals to both of the time-base triggering systems.

**Meets interference specifications of MIL-I-6181D** over the following frequency ranges—Radiated (with CRT mesh filter installed): 150 kHz to 1 GHz; Conducted (power line): 150 kHz to 25 MHz.

**Other Specifications**—size is 15" by 17" by 24"; weight is  $\approx$  80 pounds without plug-in units; power requirement is 100-130 V or 200-260 V, 50-60 Hz,  $\approx$  850 watts.

Type 556 Dual-Beam Oscilloscope . . . \$3150  
Rack Mount Type R556 Oscilloscope . . . \$3250

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### Plug-ins Illustrated

Type 1A1 Dual-Trace Unit . . . . . \$600  
(Dual-Trace: 50 mV/cm at DC-to-50 MHz, 5 mV/cm at DC-to-28 MHz. Single-Trace: 500  $\mu$ V/cm at 2 Hz-to-15 MHz. 5 Display Modes: Channel 1, Channel 2, Alternate, Chopped, Added Algebraically. Front-panel signal output.)

Type 1S1 Sampling Unit . . . . . \$1100  
(DC-to-1 GHz, internal triggering, built-in delay line. Sweep Rates: 100 ps/cm to 50  $\mu$ s/cm, with  $\pm$ 3% accuracy, normal or magnified (up to X100). DC Offset Range: greater than  $\pm$ 1 V. 4 Display Modes: repetitive, single sweep, manual scan, or external scan.)

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# NEW INSTRUMENTS



## VOLTAGE MEASUREMENTS TO 1 GHz WITHOUT TUNING

Using a principle new to voltmeters, Hewlett-Packard's Model 3406A reads ac voltages from 10 KHz to 1 GHz, resolves differences as small as 20  $\mu$ v, and shunts the measured circuit with low input capacity. In use it requires no tuning. The meter has full-scale ranges from 1 millivolt to 3 volts.

To improve its usefulness in measuring voltages at hard-to-reach points in rf circuits, Model 3406A has a pushbutton conveniently located in its probe. So long as the button is pressed, the meter will retain its reading. When the user finds that a test point is out of sight of the instrument, this memory feature makes measurement still easily possible.

In its lower frequency range (10 KHz to 100 MHz) the new meter's accuracy is  $\pm 3\%$ . At higher frequencies (100 to 700 MHz) it is  $\pm 5\%$ . At the upper extreme (700 MHz to 1 GHz) it is  $\pm 8\%$ . Useful sensitivity is provided from 1 KHz to 2 GHz.

The 3406A utilizes an incoherent sampling technique in an economical analog voltmeter combining wide bandwidth and high sensitivity. It indicates the absolute average value of the input signal regardless of the shape of the waveform, and provides greater accuracy than peak detecting voltmeters.

The new Hewlett-Packard instrument weighs only eight pounds, is 6½" high, 8⅞" wide and 11½" deep. The HP Model 3406A is priced at \$650.00.



## -HP ASSOCIATES OFFERS VERSATILE SWITCH MODEL 3530

Here is a new Microwave Single-Pole-Single-Throw PIN Diode Switch designed for integration into strip-line circuits. The hermetically sealed, ultra-miniature -hpa-3530 features broad frequency coverage, high switching ratio, and a package which matches stripline geometry.

Design of the switch package is such that simple, inexpensive stripline "N" pole, "N" throw switches may be constructed with combinations of -hpa-3530's as modules.

Dimensions of -hpa-3530 are 0.562" diameter by 0.172" thickness. Lead dimensions are .015" maximum diameter by .250" length. Operating and storage temperature limits are -65°C to +150°C maximum. At 25°C the -hpa-3530 can dissipate 1.25 watts resulting in switching ratings of 8 watts average, and more than 75 watts peak. Maximum rating as an attenuator is 1.25 watts. -hpa-3530 will withstand 1500 g shock and 20 g, 10-2000 cps vibration environments.

The price of -hpa-3530 in quantities of 1-99 is \$175.00 each. And for complete information on all Hewlett-Packard products call your local HP FIELD ENGINEER.

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