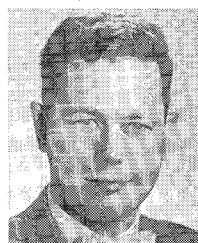


Contributors



George Biernson (M'51-SM'62) was born in Newton, Mass., on April 11, 1927. He received the B.S. degree in electrical engineering in 1948, and the M.S. degree in economics in 1949, both from the Massachusetts

Institute of Technology, Cambridge.

He was an Instructor at the University of Maine, Orono, for one year and in 1950, joined the Servomechanisms Laboratories of the Massachusetts Institute of Technology, where he performed research and development on feedback controls. In 1956 he joined the Applied Research Laboratories of Sylvania Electronic Systems, Waltham, Mass., where he is now a Senior Engineering Specialist. He has worked on radar and control systems and more recently bionics research, with particular emphasis on color vision. He designed the control system for the high-accuracy 60-foot antennas in Camp Roberts, Calif., and Ft. Dix, N. J., now being used in the Syncom satellite communication system.

Mr. Biernson was one of the founders of the IRE group on Automatic Control, and has served on several committees working on automatic control terminology. He is a member of the Optical Society of America, Inter-Society Color Council, and Sigma Xi.



Morris E. Brodwin (A'49-M'55), for a photograph and biography please see page 576 of the September, 1964, issue of these TRANSACTIONS.



Robert W. Burton (SM'65) was born in Lawrence, Mass., on April 15, 1933. He received the B.S. degree from the United States Naval Academy, Annapolis, Md., in 1955. He was commissioned into the United States Air Force after graduation from the Naval Academy and served as Project Director in Target Rockets at the Air Proving Grounds Center, Eglin AFB, holding a



patent for his work there. In 1958, under Air Force sponsorship, he commenced a two-year tour as a graduate student in electrical engineering at the Massachusetts Institute of Technology, Cambridge, where he received the

S.M. and the E.E. degrees in 1960. He joined the faculty of the United States Air Force Academy, Colorado Springs, Colo., as an instructor in 1960. In 1961, again under Air Force sponsorship, he went to Harvard University, Cambridge, Mass., where he received the Ph.D. degree in applied physics in 1964. He has since returned to the Air Force Academy as an Assistant Professor of Electrical Engineering and a Research Associate in the F. J. Seilen Laboratory, Office of Aerospace Research.

Captain Burton is an associate member of Sigma Xi.



Herbert J. Carlin (M'47-SM'50-F'56) was born in New York, N. Y. He received the B.S. and M.S. degrees from Columbia University, New York, in 1938 and 1940, respectively, and the D.E.E. degree from

the Polytechnic Institute of Brooklyn, N. Y., in 1947.

He was with Westinghouse Electric Company, Newark, N. J., from 1940 to 1945. In the latter part of 1945 he joined the Polytechnic Institute of Brooklyn where he now holds the position of Professor and Head of the Department of Electrophysics. For the current academic year (1965-1966) he is on sabbatical leave. He was the recipient of a National Science Foundation Senior Post-Doctoral Fellowship and is presently at the Ecole Normale Supérieure, Paris, France. His major work has been in the fields of microwave devices and network theory.

Dr. Carlin is a member of the American Association for the Advancement of Science, Tau Beta Pi, Sigma Xi, and Eta Kappa Nu.



Philip S. Carter (S'48-A'50-M'56) was born in Marion, Mass., on May 23, 1926. He received the B.S. degree in electrical engineering from Cornell University, Ithaca, N. Y., in 1948 and the M.S. and Ph.D. degrees

from Stanford University, Calif., in 1952 and 1954, respectively.

From 1948 to 1954 he worked in the development of aircraft antennas, including direction-finding and communications antennas while at Airborne Instruments Laboratories, Mineola, N. Y.; Stanford University, Calif., from 1948 to 1949; and the Stanford Research Institute from 1950 to 1958. From 1958 to 1959 he worked for Lockheed Missile & Space Division, Sunnyvale, Calif., on the development of microwave solid state devices. Returning to the Stanford Research Institute in 1959 he worked on the development of the magnetically tunable filter using yttrium-iron-garnet resonators. Since 1962, he has been employed by Physical Electronics Laboratories, Menlo Park, Calif., where he has continued development work in the area of magnetically tunable filters and related devices.



Kendall F. Casey, Jr. was born in Vallejo, Calif., on February 20, 1940. He received the B.S. degree in engineering from the California Institute of Technology, Pasadena, the M.S. degree in electrical engineering from the

University of Southern California, in 1961 and 1962, respectively. He has just completed the requirements for the Ph.D. degree in electrical engineering at the University of Southern California, and is expected to receive the degree in June 1965.

From 1962 to 1964 he was an Instructor in the Electrical Engineering Department, University of Southern California. He has been an Instructor in the Air Force Institute

of Technology, Wright-Patterson AFB, since October 1964. His research has been concerned chiefly with the interaction of electromagnetic waves with material medium.

Mr. Casey is a member of Eta Kappa Nu.



Edward G. Cristal (S'58-M'61), for a photograph and biography please see page 484 of July, 1964, issue of these TRANSACTIONS.

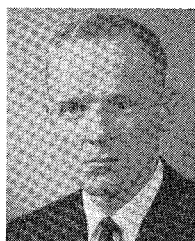


Garabet J. Gabriel (S'64) was born in Basrah, Iraq, on February 15, 1935. He received the B.S. degree from St. Louis University, Mo., the M.S. degree from the Illinois Institute of Technology, Chicago, and the Ph.D. degree

from Northwestern University, Evanston, Ill., all in electrical engineering in 1956, 1960, and 1964, respectively.

From 1956 to 1957 he was with Motorola, Chicago, Ill., where he was engaged in circuit design. From 1957 to 1961 he was a full time Instructor in electrical engineering at the Illinois Institute of Technology, Chicago. From 1961 to 1964 he was a Graduate Research Assistant in the Electrical Engineering Department, Northwestern University, Evanston, Ill. He is currently with the Aerospace Division of the Halicrafters Company, Chicago, Ill., where he is active in electro-optical communication systems, and atmospheric scattering.

Dr. Gabriel is a member of Pi Mu Epsilon, Eta Kappa Nu, and an associate member of Sigma Xi.



Henry Guckel (S'57-M'60) was born in Hamburg, Germany, on July 19, 1932. He received the B.S. degree in electrical engineering from the University of Buffalo, N. Y., in 1958. He joined the Digital Computer Laboratory,

the University of Illinois, Urbana, in 1958 as a Research Assistant. There he received the M.S. and Ph.D. degrees in electrical engineering in 1960 and 1963, respectively.

While at the University of Illinois he was engaged in research connected with high speed circuits for Illiac II. Interconnection problems in computers led to his active interest in distributed circuits. He joined the staff of the IBM Watson Research Center, Yorktown Heights, N. Y., in 1964, where he is continuing work in the area of interconnection problems.

Dr. Guckel is a member of Sigma Xi.



M. C. Horton (A'50-M'58) was born in Windsor, Ohio, on July 20, 1924. He received the B.S. and the M.S. degrees in electrical engineering from the Ohio State University, Columbus, in 1947 and 1948, respectively.

From 1948 to 1949, he was employed at the Curtiss-Wright Airplane Division, Columbus, Ohio, where he was engaged in the development of aircraft antennas. He joined Capehart-Farnsworth in 1949, engaging in radar microwave circuit development. From 1951 to 1958, he was employed by the Good-year Aircraft Corp., Akron, Ohio, in radome design and as Head of the Radar Systems Section at the Litchfield Park Laboratories. He conducted graduate studies at the University of California, Berkeley, from 1957 to 1960, while also conducting research in microwave plasma diagnostics at the Lawrence Radiation Laboratories. He joined the Research Laboratories Division of The Bendix Corp., Southfield, Mich., in 1960, and is presently Head of the Microwave Technology and Communications Department. He has been engaged recently in the application of modern network methods to microwave circuits, in latching circulator development, and in antenna synthesis techniques.



Mabo Ito (S'59-M'62) was born in Vancouver, Canada, on June 24, 1938. He received the B.Sc. degree in engineering physics from the University of Manitoba, Winnipeg, in 1960. For his work on time domain network syn-

thesis he received the M.Sc. degree in electrical engineering from the University of Manitoba in 1963.

Since 1961 he has been with the Radio and Electrical Engineering Division of the National Research Council, Ottawa, Canada, where he has been working on problems and techniques associated with fractional nanosecond microwave pulses.

He is a member of the Engineering Institute of Canada.

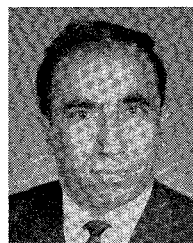


Jerome S. Jaffe (S'47-A'49-M'55) was born in Spokane, Wash., on September 27, 1923. He received the A.B. degree in physics-meteorology from the University of California, Los Angeles, in 1946, the B.S. degree in

electrical engineering from the University of California, Berkeley, in 1948, and the M.S. degree in engineering from the University of California, Los Angeles, in 1963.

He served as a Meteorologist in the Air Force from 1943 to 1946. From 1948 to 1953 he was a member of the technical staff of Hughes Aircraft Company, Culver City, Calif., where he developed microwave antennas and components for the Falcon missile project. In 1953 he became co-founder and Vice President of Cascade Research Corp., Los Gatos, Calif., where he pioneered the development of the first commercial microwave ferrite devices. From 1961 to 1963 he served as President of Technical Consultants, Inc., Encino, Calif. In 1963 he returned to Hughes Aircraft Company, where he is presently employed as a Senior Staff Engineer in the Phoenix Missile System Laboratories of the Aeronautical Systems Division.

Mr. Jaffe is a member of Eta Kappa Nu and Tau Beta Pi.

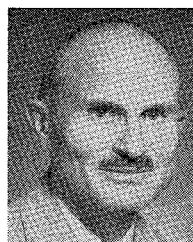


Zohrab A. Kaprielian (M'55) was born in Aleppo, Arabia, on September 23, 1923. He received the B.A. degree from the American University, Beirut, and the Ph.D. degree in electrical engineering from the University

of California, Berkeley, in 1946 and 1959, respectively.

He was a Research Fellow at the California Institute of Technology, Pasadena, from 1954 to 1956. In 1957 he joined the faculty of the University of Southern California, Los Angeles, where he is now a Professor and Chairman of the Electrical Engineering Department. His research has been in the area of artificial dielectrics, microwave circuitry, and plasma physics.

Dr. Kaprielian is a member of Sigma Xi and Eta Kappa Nu.



Ronold W. P. King (A'30-SM'43-F'53) was born in Williamstown, Mass., on September 19, 1905. He received the B.A. and M.S. degrees in physics from the University of Rochester, N. Y., in 1927 and 1929, respectively.

He received the Ph.D. degree from the University of Wisconsin, Madison, in 1932, after having done graduate work at the University of Munich, Germany, and Cornell University, Ithaca, N. Y.

He served as a Teaching and Research Assistant at the University of Wisconsin from 1932 to 1934 and as Instructor and Assistant Professor of Physics at Lafayette

College, Easton, Pa., from 1934 to 1937. During the academic year 1937 to 1938, he was a Guggenheim Fellow in Germany. In 1938 he joined the faculty of Harvard University, Cambridge, Mass., where he advanced to the rank of Professor in 1946. He is now a Gordon McKay Professor of Applied Physics at Harvard University. In 1958 he was again a Guggenheim Fellow, studying and traveling abroad.

Dr. King is a Fellow of the American Physical Society and the American Academy of Arts and Sciences, a corresponding member of the Bavarian Academy of Sciences, and a member of the American Association of University Professors, the AAAS, the MLA, Phi Beta Kappa, and Sigma Xi.

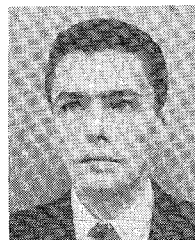


David J. Kinsley received the B.S. degree in electrical engineering from Northeastern University, Boston, Mass., in 1960, and the M.Eng. degree from Yale University, New Haven, Conn., in 1962. He

is currently a candidate for the Ph.D. degree and a teaching assistant at Yale University.

While a student at Northeastern he was employed by Raytheon Company, Newton, Mass., where he was involved in the design and testing of vacuum and gas tubes. In the summers of 1961 and 1962, he was a member of the engineering staff at RCA, Burlington, Mass. In this capacity he programmed the IBM 7090 for the BMEWS output data processor. He also performed design and system analysis activities on a computer controlled automatic test equipment. In the summer of 1963 he joined Sylvania's Applied Research Laboratories, Waltham, Mass., and has been engaged in research on electronic systems principles, including the application of those principles to biological systems, particularly in color vision.

Mr. Kinsley is a member of Eta Kappa Nu.



Werner E. Kohler (S'61), was born in New York, N. Y., on July 18, 1939. He received the B.E.E. degree from Manhattan College, N. Y., in 1961 and the M.S. degree in electrophysics from the Polytechnic Institute

of Brooklyn, N. Y., in 1963. Currently he is engaged in part-time doctoral study in electrophysics at the Polytechnic Institute of Brooklyn.

In 1964, he joined the Grumman Aircraft Engineering Corp., Bethpage, L.I., where he is working in the areas of radar

cross section reduction and microwave network theory.

Mr. Kohler is a member of Eta Kappa Nu.

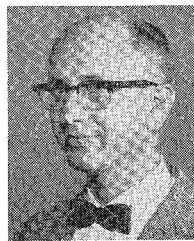


Richard C. Mackey (S'50-A'53-M'57) was born in Los Angeles, Calif., on July 27, 1926. He received the B.S. degree in electrical engineering and the M.S. degree in engineering in 1950 and 1952, respectively, from the

University of California, Los Angeles.

He was employed at the University of California as a Research Engineer and an Associate in engineering from 1950 to 1956. His work concerned the properties of materials at microwave frequencies including gas spectroscopy, paramagnetic resonance, frequency stabilization and instrumentation. From January 1957 to February 1958 he was a member of the technical staff of the Ramo-Wooldridge Corp., Los Angeles, working in the area of electronic countermeasures. Since February 1958 he has been with the University of California, Los Angeles, and is currently an Associate Professor of Engineering. He is a Consultant in the fields of microwave instrumentation, electronic countermeasures and counter-countermeasures at the Space Technology Laboratories, Los Angeles, Calif. He holds two patents in microwave instrumentation.

Mr. Mackey is a member of Tau Beta Pi, Sigma Xi, and RESA.



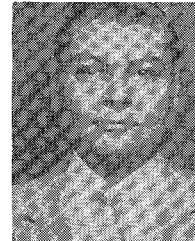
George L. Matthaei (S'49-A'52-M'57-F'65) was born in Tacoma, Wash., on August 28, 1923. He received the B.S. degree in electrical engineering from the University of Washington, Seattle, in 1948, and the Ph.D.

degree from Stanford University, Calif., in 1952.

While at Stanford University, he was a Research Assistant in the Electronics Research Laboratories, where he did research on network synthesis. In 1951, he joined the faculty of the Division of Electrical Engineering of the University of California, Berkeley, where he was an Instructor and an Assistant Professor. There he continued research on network synthesis and supervised graduate student research in that field. From 1955 to 1958, he was a member of the technical staff of the Ramo-Wooldridge Corp., Los Angeles, Calif., where he was engaged in system analysis and research on microwave components. In September, 1958, he joined the staff of the Stanford Research Institute, Menlo Park, Calif., and was engaged in microwave device research there. In June 1962, he became Manager of

the Electromagnetic Techniques Laboratory of the SRI. In July 1964 he joined the Department of Electrical Engineering, University of California, Santa Barbara, where he is now a Professor.

Dr. Matthaei is a member of Sigma Xi and Tau Beta Pi.



Jerome Rosen (M'62) was born in New York, N. Y., on October 6, 1929. After serving two years in the U. S. Army, he attended the College of the City of New York, from 1953 to 1957, majoring in electrical engineering.

He was employed by the Microwave Research Institute, Polytechnic Institute of Brooklyn, N. Y., from 1956 to 1959, where he was engaged in the experimental determination of the Weisfloch equivalent circuit elements of obstacles in multimode circular waveguide. From 1959 to 1963 he was involved in the analysis and synthesis of microwave components at Merrimac Research and Development Company, Irvington, N. J. His research activities included microwave hybrids and couplers in the IF range using "lumped" circuit techniques. He is presently with Frequency Engineering Laboratories, Farmingdale, N. J., where he is doing research and development in low noise tunable filters.



H. Seidel (A'47-M'55) was born in New York, N. Y., on October 7, 1922. He received the B.E.E. degree from the College of the City of New York in 1943. Upon graduation he served in the U. S. Naval Reserve

until 1946. He subsequently received the M.E.E. and D.E.E. degrees from the Polytechnic Institute of Brooklyn, N. Y., in 1947 and 1954, respectively.

Between 1947 and 1953 he worked in succession at the Microwave Research Institute, Polytechnic Institute of Brooklyn; The Arma Corp., Brooklyn; and the Federal Telecommunications Laboratories, Nutley, N. J. He joined the Bell Telephone Laboratories, Inc., Murray Hill, N. J., in 1953 where he has since been employed with a hiatus in the period 1961-1962. Here he has been concerned with solid-state devices specializing particularly in microwave ferrite propagation studies and parametric amplification. He left the Bell System in 1961 to help reorganize the Merrimac Research and Development Company, Irvington, N. J. His major activity there was a development of coupler concepts relating both to distributed and lumped realizations. He rejoined the Bell System in 1962, and continued his device studies there.



Joseph W. Simon (S'55) was born in Owensboro, Ky., on May 18, 1931. He received the B.S. degree in electrical engineering from the University of Kentucky, Lexington, and the M.S. degree in microwave engineering from the University of Florida, Gainesville, in 1958 and 1963, respectively.

In 1958 he joined Sperry Microwave and Electronics Company, Clearwater, Fla., as a Design and Development Engineer of ferrite and microwave components. In 1964 he joined Scientific Atlanta Inc., Atlanta, Ga., as a Senior Engineer in the microwave development area.

Mr. Simon is a member of Omicron Delta Kappa, Tau Beta Pi, and Eta Kappa Nu.



R. J. Wenzel (S'61-M'62) was born in Milwaukee, Wis., on September 11, 1939. He received the B.S. degree in electrical engineering from Marquette University, Milwaukee, Wis., in 1961, and the M.S. degree in electrical engineering from the Massachusetts Institute of Technology, Cambridge, in 1962, under an Alfred P. Sloan Fellowship.

He joined the Research Laboratories Division of The Bendix Corp., Southfield, Mich. in 1962, where he has been engaged in the development of exact synthesis techniques for distributed networks, solid-state parametric devices, and harmonic generators.

Mr. Wenzel is a member of Tau Beta Pi, Eta Kappa Nu, Pi Mu Epsilon, and an associate member of Sigma Xi.



and 1962, respectively.

From 1959 to 1962 he was a part-time Instructor in the Electrical Engineering Department, University of Southern California. He has been an Assistant Professor in the Electrical Engineering Department, University of Southern California, Los Angeles, since 1962. At present he is also a Consultant with the Jet Propulsion Laboratory, Pasadena. His research has been concerned chiefly with the guiding and propagation of microwave, and electromagnetic diffraction problems.

Dr. Yeh is a member of Sigma Xi and Eta Kappa Nu.

Selected Microwave Papers

Based on technical merit and timeliness, microwave papers in journals published outside the United States have been selected and compiled below, many with annotations. Reprints of the papers may be obtainable by writing directly to the author. The papers are in English unless noted otherwise.

—K. Tomiyasu, *Associate Editor for Abstracts*

PAPERS FROM JOURNALS PUBLISHED IN ENGLAND. COMPILED BY DR. E. A. ASH, UNIVERSITY COLLEGE, LONDON.

- 16) Multiplicative Processing Antenna Systems for Radar Applications, A. Ksienski, Hughes Aircraft Co., Culver City, Calif. *Radio and Electronic Engineer*, vol 29, pp 53-67; Jan 1965. (Presents a theoretical investigation of antenna systems using nonlinear processing techniques and evaluates the obtainable improvement in resolution. An experiment carried out at X band essentially confirms the theory.)
- 17) Some Applications of the Scattering Matrix, P. C. J. Hill, B.B.C. Research Station, Kingswood Warren, Tadworth, Surrey, England, *Proc. IEE*, vol 112, pp 15-20; Jan 1965. (A tutorial article.)
- 18) Method for Measurement of Plane Resistors at Microwave Frequencies, E. Schanda, L. v.d. Kint, and J. T. Murnaghan, Mr. Schanda is at Bern University, Bern, Switzerland, *Proc. IEE*, vol 112, pp 49-54; Jan 1965. (Describes a method of measuring the resistivity of lossy sheets by locating the sheet in a waveguide, transverse to the propagation direction, and a quarter guide wavelength from a short circuit. Detailed graphs to facilitate evaluation of measurements are presented. Results obtained at 7 Gc for a number of different materials are compared with the values predicted from dc measurements.)
- 19) Radiation from an Electric Dipole in a Plasma Column, S. R. Seshadri, Sylvania Electronic Systems, Waltham, Mass., *Proc. IEE*, vol 112, pp 249-253; Feb 1965. (The analysis, which relates to a cold, collisionless plasma is concerned with evaluating the portion of the power which is radiated, related to that which propagates as a surface wave. Conditions where the latter is small [of interest for vehicle re-entry problems] are found.)
- 20) Current Distribution and Impedance of an Antenna in a Parallel Plate Region, B. Rama Rao, Harvard University, Cambridge, Mass., *Proc. IEE*, vol 112, pp 259-268; Feb 1965. (An integral equation approach leads to an expression for the current distribution in closed form, which is shown to predict experimental results adequately. The study is particularly concerned with resonances near the points where the plates are separated by half a wavelength.)
- 21) Waves Guided by a Boundary with Time-Space Periodic Modulation, E. S. Cassedy, Polytechnic Institute of Brooklyn, Brooklyn, N. Y., *Proc. IEE*, vol 112, pp 269-279; Feb 1965. (Presents a very general treatment which embraces both propagation in periodic structures and parametric electronics and electromagnetic wave mixing phenomena. The waves found in the latter case are shown to satisfy the Manly-Rowe relationship.)
- 22) Development of Group Delay Equalizers for 4 Gc/s, D. Merlo, Post Office Research Station, Dollis Hill, London, England, *Proc. IEE*, vol 112, pp 289-295; Feb 1965. (Following a brief account of the theory of equalizers based on cavity chains in two arms of a 3 dB coupler, some specific designs carried out in the 4 Gc/s band are described. Experimental results include data on overall delay variation with ambient temperature.)