

Contributors



A. Haq Al-Ani was born in Baghdad, Iraq, in 1944. He received the B.Sc. (Eng.) degree from Baghdad University, Baghdad, in 1966, and the Ph.D. degree from London University, London, England, in 1973. His research work for the Ph.D. degree concerned the harmonic locking of microwave oscillators for phased-array applications.

After leaving London, he spent six months with the Department of Electrical Engineering, Helsinki University of Technology, Finland, and has now returned to Iraq.



Gil M. Argentina was born in New York, N. Y., on July 9, 1941. He attended Los Angeles Valley College, Los Angeles, Calif., and the University of California, Berkeley.

From 1959 to 1962 he was employed by Collins Radio Company in their ferrite manufacturing operations. In 1962 he joined the Computer Product Division, Ampex Corporation, Culver City, Calif., where he was involved with the development of new memory ferrite compositions. Since 1964 he

has been with the Research Department, Ampex Corporation, Redwood City, Calif., as an Associate Member of the Research Staff.



Paul D. Baba (M'66) was born in Elizabeth, N. J., on December 15, 1932. He received the B.S. and Ph.D. degrees in ceramics from Rutgers University, New Brunswick, N. J., in 1954 and 1960, respectively.

From 1954 to 1956 he was a Project Engineer in the Electronic Components Laboratory, Wright Air Development Center, Wright-Patterson AFB, Ohio. From 1960 to 1965 he was a Member of the Technical Staff at Bell Telephone Laboratories, Murray Hill, N. J. He then joined Ampex Corporation, Redwood City, Calif., as Manager of the Ferrite Research Section. He is also Manager of the Ferrite Materials Department, a production facility in Sunnyvale, Calif.

Dr. Baba is a member of the IEEE Magnetics Group and the American Ceramic Society.



Charles R. Boyd, Jr. (S'52-M'58-SM'65) received the B.S.E.E. degree from the Carnegie Institute of Technology, Pittsburgh, Pa., in 1953, and the M.E.E. and Ph.D. degrees in electrical engineering from Syracuse University, Syracuse, N. Y., in 1962 and 1964, respectively. He also graduated from the General Electric Company's Advanced Courses in Engineering, a three-year program of part-time graduate-level studies, in 1959.

From 1953 to 1956 he was a Field Engineer

with Westinghouse Electric Corporation, where he worked on developmental autopilot and side-looking radar equipment. In 1956 he joined General Electric, Utica, N. Y., where he helped design a missile transponder for the early Atlas guidance system. In 1957 he transferred to the General Electric Electronics Laboratory, Syracuse, N. Y., and carried out development of advanced microwave semiconductor and ferrite circuits. From 1961 to 1962 he was on academic leave at Syracuse University, and from 1962 to 1963 he supervised and taught a portion of the General Electric Advanced Courses in Engineering, returning in each case to active work at the General Electric Electronics Laboratory. In 1965 he joined the Rantec Corporation, Calabasas, Calif., where he managed an engineering group engaged in development and design of microwave solid-state components. From 1967 to 1970 he was on the faculty of the University of California, Los Angeles. He is a cofounder of the Microwave Applications Group, Chatsworth, Calif., and currently serves as President and Technical Director.

Dr. Boyd is a member of Eta Kappa Nu and is a Registered Professional Engineer in the State of New York.



Richard W. Burns (M'62) was born on July 17, 1933. He received the B.S. and M.S. degrees in electrical engineering from Colorado University, Boulder, Colo., in 1958 and 1959, respectively.

From 1959 to 1966 he worked at Hughes Ground Systems in the field of microwave semiconductor switches and phase shifters. In 1966, he joined Raytheon Semiconductor Operation where he was engaged in the development of microwave diodes. In 1967 he joined Electromagnetic Technology Corporation where he worked on microwave components and parametric upconverters. In 1967 he rejoined Hughes Aircraft Company in Fullerton, Calif., where he has been engaged in the development of phase shifters for phased array applications. He is now Head of the Component Techniques Section of the Electromagnetics Laboratory.

Mr. Burns is a member of the Institute of Electrical Engineers.



Donald A. Charlton received the B.S. degree in electrical engineering and the M.S. degree in electrophysics, both from the Polytechnic Institute of Brooklyn, Brooklyn, N. Y., in 1964 and 1965, respectively.

He is now a Staff Engineer in the Microwave Techniques Department at Hughes Aircraft Company, Fullerton, Calif., where he has been employed since 1965. His principal area of activity has been in the design and development of ferrite devices and antenna feed components.

Mr. Charlton is a member of Eta Kappa Nu.



Lawson French Cooper (S'50-A'51-M'64) was born in Brooklyn, N. Y., on February 25, 1925. He received the B.E.E. and M.E.E. degrees in electrical engineering from the Polytechnic Institute of Brooklyn, Brooklyn, N. Y., in 1951 and 1957, respectively.

He was employed by the Polytechnic Research and Development Corporation, Brooklyn, N. Y., from 1951 to 1952, where he supervised test and calibration of precision microwave measuring equipment. During the period from 1952 through 1954, he was involved in design and development of special purpose logarithmic diodes and microwave triodes at Airborne Instruments Laboratories, Mineola, N. Y. From 1954 to 1959 he was employed by the Sperry Gyroscope Corporation where his work assignments included traveling wave tube development and subcontract engineering. He has been employed by the Systems Design and Development Division, Defense and Space Center, Westinghouse Electric Corporation, Baltimore, Md., from 1959 to the present. During this period he has been concerned with traveling wave tube development and subcontract development coordination, gaseous microwave switching devices, ferrimagnetic devices, development and production, and microwave integrated circuit device development and production.

Mr. Cooper is a member of Tau Beta Pi, Eta Kappa Nu, and the IEEE Societies on Antennas and Propagation, and Microwave Theory and Techniques.



Alexander L. Cullen (M'56-SM'60-F'67) was born in London, England, in 1920. He studied at the City and Guilds College, London, England, and holds the D.Sc. (Eng.) degree.

He worked on the development of radar from 1940 to 1946 at the Royal Aircraft Establishment, Farnborough. From 1946 until 1955 he was Lecturer (latterly Reader) in Electrical Engineering at University College, London. From 1955 to 1967 he was Professor of Electrical Engineering at the University of Sheffield. He returned to University College, London, in 1967, as Professor and Head of the Electronics and Electrical Engineering Department. In 1950 he published *Microwave Measurements* jointly with Prof. H. M. Barlow, and he has contributed many other publications on microwave phenomena to the engineering journals.

Dr. Cullen has served as a member of many scientific councils and advisory committees.



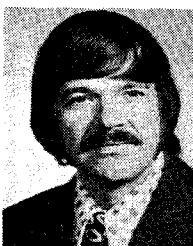
A. M. Duputz was born in 1943. She received the M.S. degree.

She is currently an Engineer with the Department d'Etudes et de Recherches en Micro-Ondes, Centre d'Etudes et de Recherches de Toulouse, Complex Aerospatial, Toulouse, France, where, since 1971, she has been in charge of the studies on the propagation in anisotropic media and, more particularly, of those studies relating to ferrite phase shifters.



John R. Forrest was born in London, England, in 1943. He received the B.A. degree from Cambridge University, Cambridge, England, in 1964, and the D. Phil. degree from Oxford University, Oxford, England, in 1967.

He spent the following three years as Research Associate and latterly Lecturer at the Institute for Plasma Research, Stanford University, Calif., where his research activities were devoted to waves and instabilities in gaseous plasmas. Since returning to England in 1970 as a Lecturer in Electrical Engineering at University College, London, he has been working on several topics concerned with IMPATT oscillators and active array antennas.



Neil H. Forrest was born in Columbia, Pa., on June 2, 1944. He received the B.S. degree in electrical engineering from the University of Florida, Gainesville, in 1965.

From 1965 to 1968 he was employed at the Westinghouse Space & Defense Center, Baltimore, Md., where he was responsible for developing and maintaining processes necessary to produce thin-film hybrid microcircuits. From 1968 to 1969 he was employed at Electronic Communications, Inc., St. Petersburg, Fla., where his responsibilities included the operation of the thin-film production laboratory. Since 1969 he has been employed at Martin Marietta Aerospace, Denver, Colo., where his duties have included the development of a complete thin-film hybrid circuit fabrication process. Recent duties have been in the area of establishing processes necessary to produce microwave integrated circuits.



Hunter C. Goodrich (A'43-SM'52) was born in Detroit, Mich., on May 20, 1920. He received the B.A. degree in physics from Wayne State University, Detroit, in 1942, and the M.S.E.E. degree from Drexel University, Philadelphia, Pa., in 1967.

After three years as a Civilian Engineer with the Signal Corps Engineering Laboratories, he joined the RCA Consumer Product Division in 1945. For the next fifteen years he produced advance developments for radio and TV receivers. Since 1960 he has been with the RCA Missile and Surface Radar Division, Moorestown, N. J. Here he has concentrated on the advanced development of radar signal processors, electrooptic correlators, and antenna steering circuits.



Jerome J. Green (SM'55) received the B.S. degree in physics from Northwestern University, Evanston, Ill., in 1954, and the M.A. degree in solid-state physics and the Ph.D. degree, both from Harvard University, Cambridge, Mass., in 1955, and 1959, respectively. His thesis dealt with ferromagnetic resonance effects in ferrites and garnets at high signal levels.

From 1956 to 1959 he worked part time in the Research Division, Raytheon Company, Waltham, Mass. Upon receipt of his doctorate in June 1959, he

joined the company on a full-time basis. At Raytheon, he has been engaged in research concerning all types of high-power effects in ferromagnetic materials at microwave frequencies. Since 1965 he has been studying the magnetic loss and high-power effects in partially magnetized materials with emphasis on materials for phase-shifter applications. He has been concerned with the development of ferrite phase shifters and phase-shifter materials for phased-array applications. Currently, he is Manager of the Magnetics Group which, in addition to its work on microwave devices and materials, is investigating magnetic memories and memory materials.



Russell L. Holden was born in Los Angeles, Calif., on June 10, 1930.

In 1955, upon completion of four years at San Francisco State College, San Francisco, Calif., he joined the IBM Corporation, Sacramento, Calif., as a Computer Field Engineer. In 1957, he transferred to the IBM Facility at San Jose, Calif., where he assisted in the development and evaluation of new products. He left IBM in 1959 to form a communication products manufacturing firm in North Hollywood, Calif. In 1966, he joined Raytheon Semiconductor, Mountain View, Calif., as a Design Engineer, where he was principally concerned with the design and development of RF solid-state products and also did considerable work in the investigation of new evaluation and application techniques. In February 1968, he joined Hughes Aircraft Company, Ground Systems Group, Fullerton, Calif., where he is presently employed as a Member of the Technical Staff engaged in the development of microwave switches and phase shifters for phased array applications.



B. E. Huckleberry was born in Brownfield, Tex., on January 2, 1935. He received the B.S. degree in electrical engineering from Arizona State University, Tempe, in 1967.

From February 1967 to September 1969 he was with Omni Spectra, Inc., Tempe, Ariz., where he was engaged in the development of microwave receiver front end components. In September 1969 he joined the RF Systems Group at Martin Marietta Aerospace, Denver, Colo., where he is currently a Senior

Staff Engineer engaged in the development of electromagnetic environment simulator systems and control circuits for these systems.

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



Henry F. Inacker (S'57-M'59) was born in Philadelphia, Pa., on April 25, 1933. He received the B.S. degree in electronic physics from LaSalle College, Philadelphia, in 1958, and the M.S.E.E. from Drexel University of Technology, Philadelphia, in 1962.

At the RCA Corporation, Moorestown, N. J., he has done advanced circuit work in the areas of analog and digital signal processing. He was the lead electrical engineer responsible for the design of the phase-shifter drivers and array interfaces for the AN/SPY-1 radar.



Gerald E. Johnson was born in Longmont, Colo., on August 15, 1940. He received the B.S. degree in electrical engineering from Colorado State University, Fort Collins, in 1963.

From 1963 to 1966 he was with the General Electric Company, Utica, N. Y. He completed General Electric's Advanced Engineering Training Program (A, B, and C courses) in 1966. During this time, he worked in the Advanced Countermeasures Engineering Unit on the development of numerous new ECM techniques. Since 1966 he has been with the Electronic Research and Development Department of Martin Marietta Aerospace, Denver, Colo., where he is engaged in system design of electromagnetic environment simulators and phased-array antenna feed systems.

Mr. Johnson is a member of Eta Kappa Nu, Kappa Mu Epsilon, and Sigma Tau.



Gus M. Kern (S'60-A'62-M'66) was born in New York, N. Y., on March 15, 1940. He received a Diploma in advanced electronics from RCA Institutes, New York, N. Y., in 1960, and the B.S.E.E. degree from Johns Hopkins University, Baltimore, Md., in 1969.

From 1961 to the present he has been associated with Westinghouse Defense and Space Center, Baltimore, Md., in the following capacities. From 1961 to 1962 he was involved in the development and evaluation of high power duplexers and gas plasma devices and was responsible for evaluation and testing of high power traveling wave tubes. From 1963 to 1965 he designed slow wave structure, magnetic circuits for temperature compensated PPM focused TWT's. He analyzed ferro-ferrimagnetic materials at microwaves and was also involved with the development and design of digital ferrite phase shifters and switches, reciprocal analog phase shifters, and modulators. From 1965 to the present he has been Senior Engineer in the Microwave-Antenna Department and has conducted studies related to phased array antennas. A part of his experience has been in materials analysis ferromagnetics and the design of ferrite devices, including high speed switching, phase shifters, and polarizers. He has engaged in studies on microwave integrated circuits, both thin and thick film and has performed array element and feed studies. Recently, he has directed system performance evaluation on radar systems.



M. M. Z. Kharadly received the B.Sc. degree in electrical engineering from Cairo University, Cairo, Egypt, in 1948, and the Ph.D. degree from the University of London (Imperial College), London, England, in 1953.

He has held faculty positions at Ein-Shams University, the University of Manchester, Manchester, England, and the University of Alberta, Edmonton, Alta. Currently, he is Professor of Electrical Engineering, University of British Columbia, Vancouver, B.C., Canada. His early research was concerned with artificial dielectrics and microwave plasma diagnostics. His current research includes work on surface waveguides, scattering by random media, and inhomogeneous and nonreciprocal lines.

Dr. Kharadly is a member of the Institution of Electrical Engineers, London.



Norman R. Landry (M'65) was born in Northbridge, Mass., on August 12, 1935. He received the B.S.E.E. degree from Worcester Polytechnic Institute, Worcester, Mass., in 1957, and the M.S.E.E. degree from Drexel Institute of Technology, Philadelphia, Pa., in 1965.

From 1957 to 1959 he served in the U.S. Army as an Electronics Instructor. He then joined the RCA Corporation, Moorestown, N. J., where he has been active in the design of microwave components for radar systems. In particular, he has concentrated on radar cross-section measurement techniques and the design of ferrite phase shifters for phased-array antenna systems.

His most recent work is in the design of solid-state transmit and receive modules for an *L*-band field-array radar.

Mr. Landry is a member of Eta Kappa Nu and Sigma Xi.



Louis J. Lavedan, Jr., was born in New Orleans, La., on November 20, 1933. He received the B.S. degree in physics from Loyola University of the South, New Orleans, in 1954, and the M.S. degree in physics from Louisiana State University, Baton Rouge, in 1956.

In 1956 he joined the RCA Corporation, Moorestown, N. J., as a member of the Missile and Surface Radar Division, as a Design Engineer responsible for high-power microwave devices, and specializing in duplexer design. In 1962 he joined Sperry Microwave Electronics Company, Clearwater, Fla. His duties included microwave subsystems design, followed by design and development responsibility for microwave ferrite phase shifters. In 1970 he returned to the RCA Corporation with responsibility for microwave ferrite phase shifters, specializing in high-power designs. Since December 1972 he has been associated with the Naval Research Laboratory, Washington, D. C., as a member of the Aerospace Systems Branch, Space Systems Division, with specialization in microwave solid-state devices and automatic microwave checkout equipment.



Ronald W. Long received the B.S.E.E. degree from Purdue University, Lafayette, Ind., in 1953.

In December 1955, after serving with the U.S. Army, he joined the Ground Systems Group, Hughes Aircraft Company, Culver City, Calif., as a Member of the Technical Staff. Initially, his work involved the development of IF and video circuits for the first Hughes ground radar systems. At the inception of the AN/SPS-33 program, he was appointed Head of the Receiver/Exciter Group for this electronic scanning phased array radar system. Following this, he organized an Advanced Development Group in the Radar Studies Department. He participated in the Coherent Radar Array (CORA) and Time Delay Array Radar (TIDAR) study programs and directed the development of wide bandwidth, high speed analog, and digital techniques for phased array radar systems. When Hughes was awarded the Advanced Development Array Radar (ADAR) contract, he became Project Engineer. He provided technical direction for the Hughes and RCA efforts on the program. In the second phase of the ADAR program, Mr. Long was appointed Senior Scientist in the ADAR project office. He directed the design and analysis of the full-scale ADAR system. Currently, he is with the Ground Systems Group, Hughes Aircraft Company, Fullerton, Calif. He serves as a consultant, as a member of the Patent Review Board,

and as coordinator of the I R&D planning for the Communications and Radar Division. He has recently directed design and analysis efforts related to the Hardsite and Cobra Dane study and proposal efforts.



Guy D. Lynes was born in Atlanta, Ga., on April 27, 1938. He received the B.S. degree in engineering physics from the University of Colorado, Boulder, in 1961, and the M.S. degree in electrical engineering from the Pennsylvania State University, University Park, in 1971.

From 1961 to 1964 he served in the U.S. Army Security Agency. From 1965 to 1971 he worked at HRB-Singer, Inc., State College, Pa., where he was responsible for design and development of broad-band microwave receivers and components. In 1971 he joined Martin Marietta Aerospace, Denver, Colo., where his present task is to develop subsystems and microstrip components for use in radar simulation and phased-array antenna feed systems.



Robert Avery Moore (S'54-M'58-SM'67) was born in Cullman, Ala., on August 12, 1932. He received the B.S. degree in electrical engineering from the University of Alabama, University, in 1954, and the M.S. and Ph.D. degrees in electrical engineering from Northwestern University, Evanston, Ill., in 1956 and 1960, respectively.

Except for six months active Army duty at which time he was assigned to the Switching Devices Group, Fort Monmouth, N. J., where he conducted research on ferrite devices, he has been employed by the Aerospace Division, Defense and Space Center, Westinghouse Electric Corporation, Baltimore, Md. During this period he has conducted studies on microwave propagation and radar systems. More recently, he has been concerned with ferrimagnetic techniques and devices. He is currently in charge of the Solid State Microwaves Group, where he is concerned with the development of microwave integrated circuit devices.

Dr. Moore is a member of the American Institute of Physics. He is a past Chairman of the Baltimore Chapter of IEEE Societies on Antennas and Propagation, and Microwave Theory and Techniques.



A. C. Priou (M'73) was born in 1944. He received the Doctor of Electronics degree in microwave option.

He is currently an Engineer with the Department d'Etudes et de Recherches en Micro-Ondes, Centre d'Etudes et de Recherches de Toulouse, Complex Aero-spatial, Toulouse, France, where he is the Chief of the Ferrite and Magnetism Section. Since 1969, he has been studying matters relating to magnetostatic delay lines, propagation in anisotropic media, ferrite broad-banding techniques, and measurements on partially magnetized ferrites. He is also Associate Professor with the Ecole Nationale Supérieure de l'Aéronautique et de l'Espace, Toulouse, France.

Dr. Priou is the French corresponding member of SMAG/TC HFM and a member of the French Commission 93/3 on Magnetic and Ferrite Components (UTE). He was the General Secretary for the First International Seminar on Microwave Ferrite Devices which was held in Toulouse, France, in March 1972.



Frank Sandy received the B.S. degree in physics from Rensselaer Polytechnic Institute, Troy, N. Y., in 1958, and the M.A. and Ph.D. degrees in physics, both from Harvard University, Cambridge, Mass., in 1959, and 1965, respectively.

Since 1965 he has been employed in the Research Division of the Raytheon Company, Waltham, Mass. He has studied the microwave properties of partially magnetized ferrites and the design of microwave ferrite devices, using computer-aided analysis techniques. His most recent work has been in the field of ultrasonics. He was responsible for designing and writing numerous computer programs for the analysis of surface acoustic-wave devices and has had extensive experience with machine-language programming for the Univac 1108, CDC 6700, and PDP-12 computers.

Dr. Sandy is a member of the American Physical Society.

of microwave antenna design and development. He has been particularly active in studies connected with beam forming techniques, impedance matching of phased arrays, and phase shifters. He is now Manager of the Microwave Techniques Department of the Electromagnetics Laboratory.

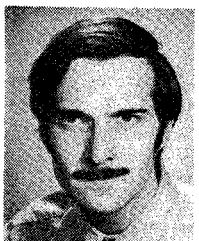
Mr. Tang is a member of Eta Kappa Nu.



Wayne D. Sato was born in Hilo, Hawaii, on November 28, 1942. He attended Santa Monica City College, Santa Monica, Calif.

After serving in the U.S. Navy in submarines he set up his own business. Later he was engaged in component development at Transco Products. From 1969 to 1973 he was employed by the Hughes Aircraft Company, Culver City, Calif., as a Research Assistant in the Antenna Department of the Radar Division. He has since gone back into

business for himself in Hilo, Hawaii.



Ronald J. Stockton was born in Morristown, N. J., on July 6, 1947. He received the B.E. degree from Stevens Institute of Technology, Hoboken, N. J., in 1969, and the M.S. degree in electrical engineering from the University of California, Los Angeles, in 1971.

Since joining the Hughes Aircraft Company, Culver City, Calif., in 1969, he has been engaged in the design and development of p-i-n diode phase shifters and associated components. He is presently Head of the Scan Control Devices Group in the Antenna Department of the Radar Division.



Raymond Tang (S'55-M'56) was born on December 18, 1933, in Shanghai, China. He received the B.S. degree from the Polytechnic Institute of Brooklyn, Brooklyn, N. Y., in 1953, and the M.S. degree from the University of Southern California, Los Angeles, in 1958, both in electrical engineering.

From 1955 until 1959, he was with Hughes Aircraft Company, Culver City, Calif. Since 1959 he has been with Hughes Aircraft Company, Fullerton, Calif., where he has been concerned with the fields



Franklin G. Terrio was born in Chippewa Falls, Wis., on June 24, 1937. He received the B.S. and M.S. degrees in engineering from the University of California, Los Angeles, in 1959 and 1963, respectively.

Since joining Hughes Aircraft Company, Culver City, Calif., in 1959, he has been engaged in applied research and development of electronic scanning antennas, assorted microwave components, and more recently p-i-n diode phase shifters. He is presently a Staff Engineer in the Antenna Department of the Radar Division.

Mr. Terrio is a member of Tau Beta Pi.



Joseph F. White (S'60-M'61) received the B.S.E.E. degree from Case Institute of Technology, Cleveland, Ohio, in 1960, the M.S.E.E. degree from Northeastern University, Boston, Mass., in 1965, and the Ph.D., with specialty in electrophysics, from Rensselaer Polytechnic Institute, Troy, N. Y., in 1968.

From 1960 to 1961 he was a Member of the Technical Staff at the MITRE Corporation, Bedford, Mass., responsible for the design and integration of microwave components used in an interferometry radar. Since 1961 he has been with Microwave Associates, Inc., Burlington, Mass., and has been engaged in the development of semiconductor-microwave devices—including high power phase shifters, switches, duplexers, frequency multipliers, transistor amplifiers, and Gunn and avalanche diode microwave sources. During this time his specialty has been development of p-i-n diode phase shifters for transmit and receive phased array radar antennas. He developed and patented the transmission phase shifter which made practical diode steering of the array antennas used in the PAR and MSR radars of the U.S. Safeguard System. Currently, he is the Technical Director of the Microwave Products Group at Microwave Associates and is responsible for the design and completion of the several thousand phase shifters which will steer the Cobra Dane Radar antenna being built by the Raytheon Company, Wayland, Mass., for the U.S. Air Force.

Dr. White is a member of Eta Kappa Nu, Sigma Xi, the IEEE Group on Electron Devices, and the IEEE Microwave Theory and Techniques Society.