

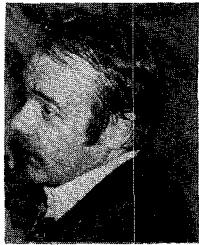
Contributors



Masami Akaike (M'76) was born in Kamakura-shi, Kanagawa-ken, Japan, on October 15, 1940. He received the B.S., M.S., and Ph.D. degrees from the University of Tokyo, Tokyo, Japan, in 1964, 1966, and 1969, respectively.

Since joining the Musashino Electrical Communication Laboratory, Nippon Telegraph and Telephone (NTT) Public Corporation, Tokyo, Japan, in 1969, he has been engaged in the research of millimeter-wave solid-state circuits and the development and design of repeaters and measuring equipments for a guided millimeter-wave transmission system. He is currently a Staff Engineer of the Millimeter-Wave Transmission Section, Trunk Transmission System Development Division, Yokosuka Electrical Communication Laboratory, NTT.

Dr. Akaike is a member of the Institute of Electronics and Communications Engineers of Japan, and was a recipient of the 1971 IECEJ Yonezawa Memorial Scholarship.



Günther Begemann was born in Oerlinghausen, West Germany, on February 4, 1948. After receiving the Dipl. Ing. degree in electrical engineering, he joined the Institut für Hochfrequenztechnik of the Technische Universität, Braunschweig, West Germany, in 1975.

He is, at present, studying toward the Ph.D. degree. He is now working on microwave solid-state circuits, especially phase modulators and mixers, and planar integrated circuits.

Mr. Begemann is member of the Verband Deutscher Elektrotechniker.

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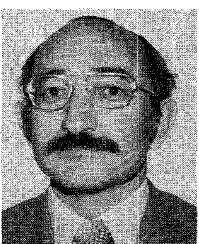
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Akira Amano was born in Yamanashi, Japan, on April 11, 1935. He received the B.S. degree in electronics engineering from Waseda University, Tokyo, Japan in 1960.

In the same year, he joined the Communication Equipment Works, Mitsubishi Electric Corporation, where he has been engaged in the design of microwave radio equipments. Now he is a section manager in the Satellite Communications and Microwave Equipment Engineering Department.

Mr. Amano is a member of the Institute of Electronics and Communications Engineers of Japan.



Abe B. Bell (M'67) was born in Toronto, Canada, on June 14, 1934. He received his B.A.Sc. degree with honors in engineering physics from the University of Toronto in 1956.

He joined RCA Limited (now Spar Technology Limited), Montreal, Canada, in 1958, where his design responsibilities included solid-state amplifiers, upconverters, downconverters, and frequency multipliers for use in the company's microwave radio relay, ground station, and satellite communications equipment. There he became Manager, Aerospace Development Group, in 1975.

He is a member of the Corporation of Engineers of Quebec.

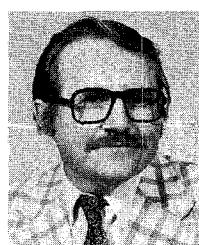
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Ali E. Atia (S'67-M'69) was born in Cairo, United Arab Republic, on August 10, 1941. He received the B.S. degree with honors from Ain Shams University, Cairo, in 1962, and the M.S. and Ph.D. degrees from the University of California, Berkeley, in 1966 and 1969, respectively, all in electrical engineering.

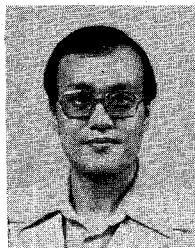
From 1962 to 1964, he was a Lecturer in the Department of Electrical Engineering, Ain Shams University. From 1965 to 1968 he was a Research Assistant in the Electronics Research Laboratory, University of California. From 1968 to 1969 he was a Teaching Fellow and Assistant Professor in the Department of Electrical Engineering and Computer Sciences, University of California. Currently, he is a Technical Staff Member of the Transponders Department, RF Transmission Laboratory, COMSAT Laboratories, Clarksburg, MD, where he is engaged in the development of various microwave subsystems for communication satellite transponders.



Robert L. Bernick (M'70) was born in St. Paul, MN, on May 7, 1938. He received the B.A. degree (magna cum laude) in mathematics from the University of Minnesota, Minneapolis, in 1959, the M.S. degree in physics from the University of California, Berkeley, in 1962, and the Ph.D. degree in physics from the University of Southern California, Los Angeles, in 1970.

In 1959 and 1960 he was with the AC Spark Plug Division, General Motors Corporation, El Segundo, CA, where his work was concerned with inertial guidance systems. From 1962 to 1965 he was employed at the Atomics International Division of North American Aviation Corporation, Canoga Park, CA, where he worked on nuclear reactor kinetics and reactor shielding design. In 1969 he joined the Hughes Aircraft Company where he is now with the Torrance Research Center, Torrance, CA. He has worked on the research and development of microwave semiconductor devices including avalanche and Gunn diodes and field-effect transistors. Currently he heads a section developing microwave and millimeter-wave silicon IMPATT diodes.

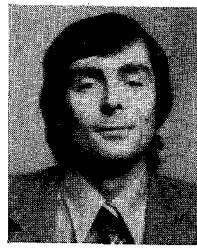
Dr. Bernick is a member of Phi Beta Kappa.



David C. Chang (S'65-M'67-SM'76) was born in Hupeh, China, on September 9, 1941. He received the B.S. degree in electrical engineering from Cheng Kung University, Tainan, Taiwan, China, in 1961 and the M.S. and Ph.D. degrees in applied physics from Harvard University, Cambridge, MA, in 1963 and 1967, respectively.

He joined the University of Colorado, Boulder, in 1967, and is now a Professor of Electrical Engineering. In 1972, he was a Visiting Professor at Queen Mary College, University of London, London, England. In addition, he was also a guest worker with the theoretical study group at the Environmental Research Laboratory, US National Oceanic and Atmospheric Administration in 1975 and 1976. He is a Consultant to Kaman Science Corp., Colorado Springs, CO, and to Southeastern Center for Electrical Engineering Education, Inc., Bridgeport, NY.

Dr. Chang is a member of Sigma Xi and the International Scientific Radio Union Commissions A, B, C, and E. He is currently Chairman of the IEEE-MTT-S 15 Subcommittee on Microwave Field Theory, and Chairman of the Denver Chapter of the IEEE EMC/IM group.



David A. Cowan was born in Middlesex, England, on July 25, 1949. He received the B.A. and M.A. degrees with honors in physics from Wadham College, Oxford, England, in 1970 and 1974, respectively.

From 1970 to 1974 he was a Development Engineer with Decca Radar Limited where his design responsibilities included PIN diode switches, Schottky Barrier diode mixers and detectors, waveguide mechanical switches, and bulk effect oscillators. In 1974 he joined RCA Limited (now Spar Technology Limited), Montreal, Canada, where he worked on the development of low noise and medium power SHF FET amplifiers for communications satellites.

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Chente Chao (M'73) was born in Shanghai, China, on January 19, 1937. He received the B.S. and M.S. degrees from the Georgia Institute of Technology, Atlanta, and the Ph.D. degree from the University of Michigan, Ann Arbor, in 1966, 1968, and 1974, respectively, all in electrical engineering.

Since joining Hughes Aircraft Company, Torrance, CA, in April 1974, he has been engaged in research and development of IMPATT diode oscillator and amplifier and integrated circuits in millimeter-wave frequencies. From 1969 to 1973, he was with the Electron Physics Laboratory, Department of Electrical and Computer Engineering, University of Michigan, as a research assistant, where he worked on research programs on the nonlinear operating characteristics, bias modulation, self-mixing and noise properties of IMPATT diode oscillators. From 1966 to 1968, he worked for Western Electric Company, Atlanta, GA, where he was an Engineer engaged in broadband and power equipment engineering for telephone communication systems.

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



Harry M. Cronson (S'58-M'64-SM'72) received the Sc.B. (summa cum laude), Sc.M., and Ph.D. degrees in electrical engineering from Brown University, Providence, RI. He also held a Keen Post-Doctoral Fellowship at Oxford University, Oxford, England.

In 1964 he joined the Polytechnic Institute of Brooklyn, Farmingdale, NY, as Assistant Professor of Electrophysics. After employment with the Avco Space System Division, Wilmington, MA, and IKOR, Inc., Burlington, MA., he joined the Sperry Research Center, Sudbury, MA, in 1971 as a Member of the Technical Staff. His present research interests include microwave metrology and applications of short-pulse radar systems.

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Ming Hui Chen (M'68) was born in Chechiang, China, on September 3, 1937. He received the B.S. degree in electrical engineering from the Cheng Kung University, Taiwan, China, in 1960; the M.S. degree in electronics from Chiao Tung University, Taiwan, China, in 1962; the M.S.E.E. degree from Utah State University, Logan, in 1964; and the Ph.D. degree in electrophysics from Polytechnic Institute of Brooklyn, Farmingdale, NY, in 1969.

He was a Chief Microwave Engineer at Microtech Company, a Principal Engineer at Radiation Systems, Inc., a Member of the Technical Staff at MIT Lincoln Laboratory and COMSAT Laboratories. In 1970, he was also appointed as an Assistant Professor at George Washington University, Washington, DC. Since August, 1977, he joined TRW Systems Group at Redondo Beach, CA, as a Senior Staff Engineer in the Antenna and Communication Laboratory.

Dr. Chen's major interests are microwave devices, antennas, and wave propagation in periodic structures.



Rene J. Douville (S'64-M'68) was born in Coleman, Alberta, Canada on March 30, 1943. He received the B.A.Sc. and M.A.Sc. degrees in electronics engineering from the University of British Columbia, Vancouver, Canada, in 1966 and 1968, respectively.

He joined the Space Electronics Directorate, Defence Research Telecommunications Establishment, later to become the Communications Research Center, in 1968. He has worked on VHF mixers, microwave solid-state multipliers and oscillators, microstrip discontinuity studies, and performed a conceptual design of a microwave attitude sensing system using higher order mode conical feeds. He was responsible for the design of one of the two redundant 12-GHz FET amplifiers used on the Hermes (CTS) satellite. In 1976 he became Project Leader of the Low Cost Earth Terminal Project for which he has designed MIC image-enhanced mixers.

Mr. Douville is currently Chairman of the Ottawa Chapter of the MTT and a member of the Steering Committee for the 1978 MTT Symposium.

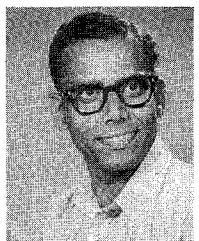


Glenn F. Engen (SM'71) was born in Battle Creek, MI, on April 26, 1925. He received the B.A. degree in physics and mathematics from Andrews University, Berrien Springs, MI, in 1947, and the Ph.D. degree in electrical engineering from the University of Colorado, Boulder, in 1969.

After employment with the US Naval Ordnance Laboratory and Applied Physics Laboratory, The Johns Hopkins University, Baltimore, MD, he joined the National Bureau of Standards in 1954 and is now Senior Research Consultant, Electromagnetics Division, Boulder, CO. His special field of research competence is microwave measurement and techniques. He is the author of more than 35 published papers in the field of microwave measurements and holds two patents.

Dr. Engen is a member of Commission I of the International Scientific Radio Union. He was awarded the Silver Medal for Meritorious Service and the Gold Medal for Distinguished Achievement in the Federal Service by the Department of Commerce in 1961 and 1976, respectively.

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Achintya K. Ganguly was born in Bengal, India, on December 3, 1930. He received the Ph.D. degree in physics from New York University, New York, in 1965.

From 1965 to 1967 he was a Postdoctoral Fellow in the Department of Physics, New York University, where he was engaged in research on the scattering of light from quasi-particles in solids. From 1967 to 1972 he was a Staff Member at GTE Laboratories, Bayside, NY, and worked on electron-photon interactions in solids and nonlinear acoustics. He joined the Naval Research Laboratory, Washington, DC, in 1972 as a Research Physicist. He is now working on magneto-static and magnetoelastic surface-wave propagation in layered structure.

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Hans R. Gernerlich (S'69-M'75) was born in Heidelberg, Germany, May 5, 1941. He received the Diplom Ingenieur in electrical engineering from the University of Karlsruhe in 1967 and the M.S. and Ph.D. degrees in electrical engineering from Lehigh University, Bethlehem, PA, in 1969 and 1975, respectively.

He was Assistant Professor at the Department of Electrical Engineering, Lehigh University, and is currently with the Electrical Engineering College, University of South Alabama, Mobile, AL.

Dr. Gernerlich received a Certificate of Merit award for outstanding Scholastic achievement in 1967. He is a member of Eta Kappa Nu.

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Robert G. Harrison was born in London, England, on July 29, 1932. He received the B.A. and M.A. degrees in 1956 and 1960, respectively, from the University of Cambridge, England, and the Ph.D. degree in electrical engineering from London University and the Diploma of Imperial College in 1964.

From 1956 to 1957 he was with Computing Devices of Canada Ltd., Ottawa, Ont., Canada. In 1957 he joined the Canadian Defence Research Board, Ottawa, Ont., Canada, where he worked on high-speed logic devices. During 1960 he was consultant to Central Dynamics Ltd., Montreal, P.Q., Canada. From 1960 to 1964 he

investigated steady-state and transient phenomena in parametric subharmonic oscillators. In 1964 he joined the Research Laboratories, RCA Limited, Montreal, P.Q., Canada, where he was engaged in analog-digital aerospace systems. Subsequently, he became involved in the analysis of nonlinear microwave semiconductor devices and the prediction of multi-carrier intermodulation spectra. Recent activities include the design of a portable 11-GHz earth station for the reception of transmissions from the Communication Technology Satellite "Hermes" and the development of a wide-band microwave frequency-division system. In 1977 he joined Com Dev Ltd., Montreal, P.Q., Canada, as Director of Research, where he is continuing his work on microwave frequency dividers.

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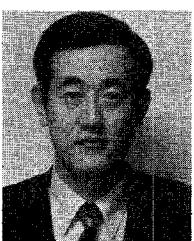


Cletus A. Hoer (S'66-M'67) was born in Westphalia, MO, in 1933. He attended Weber State College, Ogden, UT, and Sophia University, Tokyo, Japan, while serving in the US Air Force from 1950-1954. He received the B.S. and M.S. degrees in electrical engineering from the University of Colorado, Boulder, in 1959 and 1967, respectively.

He joined the Boulder Laboratories, National Bureau of Standards, Boulder, CO, in 1956, where he was first engaged in developing instru-

mentation for measuring properties of magnetic materials at high frequencies. In 1962, he transferred to the High Frequency Impedance Standards Section, where he did research and development work in inductance standards, impedance bridges, inductive voltage dividers, attenuators, and directional couplers. His present project is concerned with the theory and application of six-port junctions in the measurement of two-port circuit parameters.

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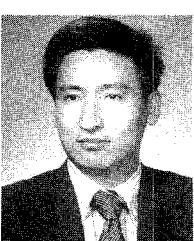


Takashi Ishii was born in Osaka, Japan on July 8, 1941. He received the B.S. degree in material science from Tohoku University in 1964.

In the same year he joined the Central Research Laboratory, Mitsubishi Electric Corporation. Since then, he has been engaged in the research and development of solid-state microwave devices and materials for them. From 1975 to 1976, he joined the Microwave Institute Foundation, Stockholm, Sweden as a Research Associate.

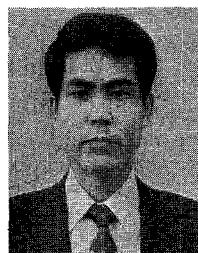
Mr. Ishii is a member of the Electrochemical Society and the Japan Society of Applied Physics.

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Tatsuo Itoh (S'69-M'69-SM'74) received the Ph.D. degree in electrical engineering from the University of Illinois, Urbana, in 1969. From Sept. 1966 to Apr. 1976 he was with the Electrical Engineering Department, University of Illinois. From Apr. 1976 to Aug. 1977 he was a Senior Research Engineer in the Radio Physics Laboratory, SRI International, Menlo Park, CA. In Aug. 1977, he joined the University of Kentucky, Lexington, where he is now an Associate Professor of Electrical Engineering.

Dr. Itoh is a member of the Institute of Electronics and Communication Engineers of Japan, Sigma Xi, and Commissions B and C of URSI.

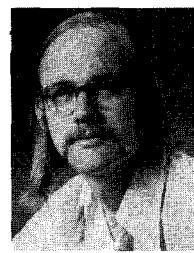


Eiji Kaji was born in Tokyo, Japan on June 25, 1943. He received the B.S. and M.S. degrees in electronics engineering from Waseda University, Tokyo, Japan, in 1967 and 1969, respectively.

In 1969, he joined the Communication Equipment Works, Mitsubishi Electric Corporation, where he has been engaged in the design of microwave radio equipments. Now he is a unit leader in the Satellite Communications and Microwave Equipment Engineering Department.

Mr. Kaji is a member of the Institute of Electronics and Communication Engineers of Japan.

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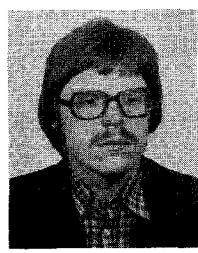
Edward F. Kuester (S'73-M'76) was born in St. Louis, MO, on June 21, 1950. He received the B.S. degree from Michigan State University, East Lansing, in 1971, and the M.S. and Ph.D. degrees from the University of Colorado, Boulder, in 1974 and 1976, respectively, all in electrical engineering.

From 1972 to 1976 he was a Research Assistant at the University of Colorado, Boulder, investigating some theoretical aspects of optical waveguides. In 1974-1975 he was also a Teaching

Associate at the University of Colorado, Denver. Since 1976, he has been an Assistant Professor in the Department of Electrical Engineering at the University of Colorado, Boulder. His research has included the electromagnetic theory of open waveguiding structures in optics as well as at microwave frequencies.

Dr. Kuester is a member of the Optical Society of America.

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Reinhard Knöchel was born near Hamburg, West Germany, on June 20, 1948. He received the Dipl. Ing. degree in electrical engineering from the Technische Universität Braunschweig, West Germany, in 1975, and joined the Institut für Hochfrequenztechnik of that university the same year.

At present he is studying towards the Ph.D. degree. He is working on stabilization and injection locking of microwave oscillators and is currently interested in the investigation of new methods of microwave integration in the frequency region above Ku band.

Mr. Knöchel is a member of the Verband Deutscher Elektrotechniker.

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Nobuo Kuwabara (S'75-M'77) was born in Nakatsugawa, Gifu, Japan, on June 1, 1952. He received the B.E. and M.E. degrees in electronic engineering from the Shizuoka University, Hamamatsu, Japan, in 1975 and 1977, respectively.

He joined the Electrical Communication Laboratories, Nippon Telegraph and Telephone Public Corporation, Tokai-mura, Ibaragi, Japan. His research at the Shizuoka University dealt with the mounting structures for microwave solid-state devices. He is currently involved in studies of the electrical surge on the communication network.

Mr. Kuwabara is a member of the Institute of Electronics and Communication Engineers of Japan.

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Ernest L. Komarek (M'71) was born in Chicago, IL, on March 3, 1926. He received the B.S. degree in engineering physics from the University of Colorado, Boulder, in 1956.

Upon completing his undergraduate studies, he joined the Central Radio Propagation Laboratory, National Bureau of Standards, Boulder, CO, where he was engaged in the instrumentation of radio propagation experiments. In 1964 he transferred to the Radio Standards Laboratory, currently known as the Electromagnetics Division of the Institute for Basic Standards, and is engaged in CW RF power measurements. He is currently concerned with automated measurement techniques in the microwave spectrum and measurement assurance programs as a technique for dissemination of RF standards.

Mr. Komarek is a member of the S-MTT AdCom, and chairman of S-MTT Technical Committee for Microwave Measurements.

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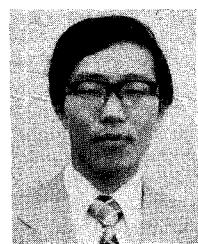


Don H. Lee (S'66-M'69) received the B.S., M.S., and Ph.D. degrees in electrical engineering from the California Institute of Technology, Pasadena, CA, in 1963, 1964, and 1969, respectively.

In 1969 he joined the Hughes Research Laboratories, Malibu, CA, where he has been engaged in ion-implantation studies for semiconductor device application. He is presently working on ion-implanted microwave devices for the Hughes Torrance Research Center, Torrance, CA.

Dr. Lee is a member of the American Physical Society, the Electrochemical Society, and Sigma Xi.

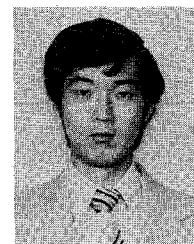
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Hiroshi Kondoh (S'73-M'75) was born in Nagoya, Japan, on February 18, 1951. He received the B.E. and M.E. degrees in electronic engineering from the Shizuoka University, Hamamatsu, Japan, in 1973 and 1975, respectively.

Since 1975 he has been with the Research Institute of Electronics, Shizuoka University, as a Research Assistant. His research deals with the microwave-biased photodetector and the solid-state oscillator.

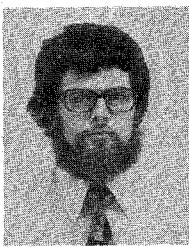
Mr. Kondoh is a member of the Institute of Electronics and Communication Engineers of Japan.



Japan.

Eiji Maekawa was born in Monbetsu, Hokkaido, Japan, on April 17, 1951. He received the B. Eng. degree in electrical engineering from Kitami Institute of Technology, Kitami, Hokkaido, Japan, in 1974, and the M. Eng. degree from Hokkaido University, Sapporo, Hokkaido, Japan, in 1976, where he is currently working towards the Ph.D. degree. His research interest is in the field of distributed networks.

Mr. Maekawa is a member of the Institute of Electronics and Communications Engineers of

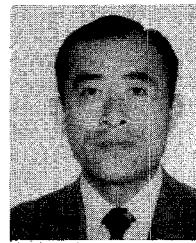


Paul Mercer was born in Toronto, Canada, on June 7, 1948. He received the B.A.Sc. degree with honors in electrical engineering from the University of Toronto in 1971.

From 1971 to 1973 he worked on computer optimization of microwave networks. In 1973 he joined RCA Limited (now Spar Technology Limited), Montreal, Canada, where he first worked on the design and specification of land-based microwave communications systems. He then joined the Aerospace Group where his responsibilities involved microwave filter multiplexing equipment and then solid-state MIC receivers at 6/4 GHz and 14/12 GHz.

Responsibilities involved microwave filter multiplexing equipment and then solid-state MIC receivers at 6/4 GHz and 14/12 GHz.

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Shizuo Mizushima (S'60-M'66) was born in Hamamatsu, Japan, on August 10, 1933. He received the B.E. degree in electronic engineering from the Shizuoka University, Hamamatsu, in 1957, and the M.S. and Ph.D. degrees in electrical engineering, from the Ohio State University, Columbus, Ohio, in 1962 and 1964, respectively.

From 1957 to 1960 he was a Research Assistant and a Lecturer at the Shizuoka University. From 1964 to 1965 he was a Member of the Technical Staff at the Bell Laboratories, Murray Hill, NJ.

In 1965 he returned to the Shizuoka University, where he is a Professor at the Research Institute of Electronics. His current research deals with the microwave device circuit interactions.

Dr. Mizushima is a member of the Institute of Electronics and Communication Engineers of Japan and Sigma Xi.

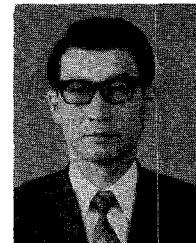
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Wolfgang Meyer was born in Hamburg, West Germany, on January 25, 1948. He received the Diplom-Ingenieur degree in electrical engineering and the Doktor-Ingenieur degree from Technische Universität Braunschweig, Braunschweig, West Germany, in 1973 and 1977, respectively.

Since 1973 he has been working at the Institut für Hochfrequenztechnik of the Technische Universität Braunschweig, engaged in theoretical and experimental investigations on high-frequency measurements, superconductivity, and low-temperature dielectric loss mechanisms. In addition, his current research interests are also concerned with the development of multimode optical fibre communication systems.

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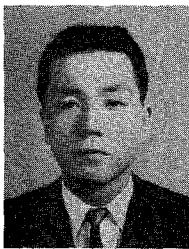


Nobuo Nagai (M'74) was born in Tokyo, Japan, on January 5, 1938. He received the B.S. and Dr. Eng. degrees from Hokkaido University, Sapporo, Hokkaido, Japan, in 1961 and 1971, respectively.

He is currently an Associate Professor with the Research Institute of Applied Electricity, Hokkaido University. He has been engaged in research on distributed networks. He was with Cornell University, Ithaca, NY, as a Visiting Research Associate for one year, from September 1972.

Dr. Nagai is a member of the Institute of Electronics and Communications Engineers of Japan.

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Shigeru Mitsui was born in Kofu, Japan, on January 8, 1938. He received the B.S. degree in applied physics from Waseda University, Tokyo, Japan in 1961, and the Ph.D. degree in electrical engineering from Osaka University, Osaka, Japan in 1972.

He joined the Mitsubishi Electric Company, Ltd., in 1961, and has been engaged in the development of microwave semiconductor devices including Gunn diodes, IMPATT diodes, and GaAs MESFET's, and also optical semiconductor devices, including APD's and optical IC's. He is now a Research Manager of the Microwave Devices Group in Central Research Laboratory of Mitsubishi Electric Company.

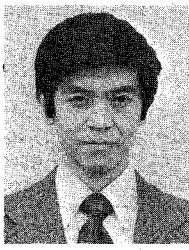
Dr. Mitsui is a member of the Japan Society of Applied Physics and the Institute of Electronics and Communication Engineers of Japan.

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Tsukasa Nagao, for a photograph and biography please see page 236 of the March 1977 issue of this *Transactions*.

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Yasuo Mitsui was born in Kobe, Japan, on April 29, 1949. He received the B.S. degree in applied physics from Tokyo University, Tokyo, Japan, in 1972.

He joined the Mitsubishi Electric Company, Ltd., in 1972, and has been engaged in the development of microwave semiconductor devices including Si TRAPATT diodes and GaAs MESFET's. He is now a member of the Technical Staff in the Microwave Devices Group in Central Research Laboratory of Mitsubishi

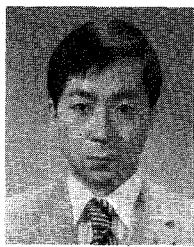
Electric Company.

Mr. Mitsui is a member of the Institute of Electronics and Communication Engineers of Japan.

Edward M. Nakaji (M'71) was born in New York City, NY, on March 19, 1926. He received the A.B. degree in physics from Earlham College, Richmond, IN, in 1949 and the M.S. degree in physics from Northwestern University, Evanston, IL.

Between 1951 and 1970 he was employed by Central Scientific Company, Chicago, IL, where he was responsible for the design and development of vacuum equipment; by the Helipot Corporation, Fullerton, CA, where he was engaged in the study of vacuum deposited semiconductor thin films; by the Hughes Aircraft Company, Semiconductor Division, Newport Beach, CA, where he was in charge of the development of fast switching silicon diodes; and by Teledyne Semiconductors, Hawthorne, CA, where he was involved in the development of silicon diodes and integrated circuits. In 1971, he rejoined the Hughes Aircraft Company, Torrance, CA, where he is currently engaged in the research and development of solid-state microwave devices. He is now in the Semiconductor Processing Department of the Electron Dynamics Division where he is Head of the Process Development Section.

Mr. Nakaji is a member of the American Physical Society.



Masaaki Nakatani was born in Okayama, Japan, on July 27, 1942. He received the B.S. and M.S. degrees in physics from Osaka University, Osaka, Japan, in 1965 and in 1967, respectively.

He joined the Mitsubishi Electric Company, Ltd., in 1970, and has been working on the development of microwave semiconductor devices and circuits including GaAs MESFET's and MIC's. He is now a member of the Technical Staff in the Microwave Devices Group in Central Research Laboratory of Mitsubishi

Electric Company.

Mr. Nakatani is a member of the Japan Society of Applied Physics and the Institute of Electronics and Communication Engineers of Japan.



John Ondria received the B.S., M.S., and Ph.D. degrees in electrical engineering in 1960, 1963, and 1967, respectively, from Lehigh University, Bethlehem, PA.

From 1960 to 1964 he was with the Western Electric Company, Allentown, PA. From 1964 to 1965 he was a consultant to Microwave Associates, Incorporated, Burlington, MA, and from 1965 to 1967 he was a Senior Research Engineer there. From 1968 to 1971 he was a consultant to Westinghouse Electric Corporation Aerospace Center, Baltimore, MD. Currently, he is a consultant to TRG in the area of microstrip sub-harmonic mixers/oscillators, and is an Associate Professor at Lehigh University, Bethlehem, PA.

Dr. Ondria received the Walter B. Morton Award in 1960. He is a member of Eta Kappa Nu, Tau Beta Pi, and Sigma Xi.

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Edward C. Niehenke (M'61) was born in Abington, PA, on August 5, 1937. He received the B.S. (1961) and M.S. (1965) degrees in electrical engineering from Drexel University, Philadelphia, PA.

From 1961 to 1963, he was employed by Martin Marietta, Baltimore, MD, where he was engaged in the investigation of solid-state device behavior at cryogenic temperatures and low-loss cryogenic superconducting delay lines. Since 1963, he has been employed by Westinghouse Electric Corporation, Baltimore, MD, responsible for the development of low-noise broadband parametric amplifiers (S, X, K_u, and K_a bands), FET amplifiers, upconverters, frequency doublers, mixers, and miniature-microwave integrated circuits.

Mr. Niehenke is a registered professional engineer in the State of Maryland.

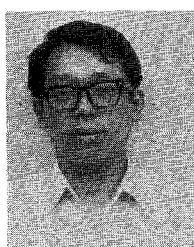
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Koujiro Ono was born in Saitama prefecture, Japan, on September 19, 1925. He graduated from the Sapporo Electrical Junior College, Sapporo, Japan, in 1952.

From 1941 to 1947 he worked at the Kokusai Denshin Denwa Company, Ltd, Tokyo, Japan. Since 1948, he has been working at the Research Institute of Applied Electricity, Hokkaido University, Sapporo, Japan, where he is now a Research Associate-Senior Technician. He has been engaged in research and development on microwave circuits.

Mr. Ono is a member of the Institute of Electronics and Communications Engineers of Japan.



Kazuo Nishitani was born in Kagawa, Japan on October 1, 1946. He received the B.S. and M.S. degrees in electrical engineering from Osaka University, Osaka, Japan, in 1969 and 1971, respectively.

In 1971, he joined the Central Research Laboratory, Mitsubishi Electric Corporation. Since then, he has been engaged in the research and development of GaAs IMPATT diodes.

Mr. Nishitani is a member of the Institute of Electronics and Communication Engineers of

Japan.

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Kazuhito Ohnishi was born in Osaka, Japan, on August 28, 1947. He received the B.S. and M.S. degrees in electrical engineering, both from Osaka University, Osaka, Japan, in 1971, and 1973, respectively.

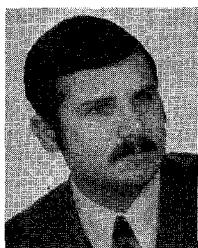
Since joining the Yokosuka Electrical Communication Laboratory, Nippon Telegraph and Telephone (NTT) Public Corporation, Yokosuka, Japan, in 1973, he has been engaged in the research of millimeter-wave solid-state circuits. He is currently an Engineer of the Millimeter-Wave

Transmission Section, Trunk Transmission System Development Division, Yokosuka Electrical Communication Laboratory, NTT.

Mr. Ohnishi is a member of the Institute of Electronics and Communication Engineers of Japan.

Stig Rehnmark (S'71-M'76) was born in Hörnefors, Sweden, on August 12, 1944. He received the M.Sc. and Ph.D. degrees in electrical engineering, both from Chalmers University of Technology, Göteborg, Sweden, in 1969 and 1976, respectively.

From 1969 to 1975 he was a Research and Teaching Assistant at the Division of Network Theory, Chalmers University of Technology. His fields of interest at that time were microwave couplers, phase shifters, and power dividers. In April 1975 he became the Research Engineer in the same division and he was the Project Leader for the Chalmant antenna. Chalmant is the first two-dimensional (8 × 8 elements) phased array in Sweden and is intended for maritime satellite communication in the L band. In 1976, he received a scholarship from the Sweden American Foundation for studies in the United States. Since July 1976 he has been on a leave of absence from his position at Chalmers and is currently with Anaren Microwave, Inc., Syracuse, NY. At Anaren he has been working on the research, development, and production of couplers, baluns, power dividers, mixers, beam-forming networks, and other microwave components in the frequency range 30 MHz-18 GHz.



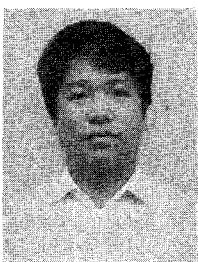
aided design.

Mootaman Safi was born in 1950. He received the B.Sc. degree in electrical engineering from the University of Aleppo, Aleppo, Syria, in 1972 and the M.Sc. degree in electronic engineering from the University of Kent at Canterbury, Kent, England, in 1975. He is, at the present time, studying for the Ph.D. degree at the University of Kent.

From 1973 to 1975 he was involved in projects on microwave antennas, relay-stations, and propagation studies at K band. His current field of interest is microwave filter circuits and computer-

aided design. the areas of microwave circuit and system design, fabrication, and application. His articles in various electronics periodicals number over twenty in the past three years. He has also lectured around the US, and is a regular speaker at the Annual West Coast UHF Conference. Avocationally, he is a leading UHF/microwave experimenter, holding an extra-class amateur radio license. In that connection, he has explored tropospheric scatter and meteor scatter propagation techniques, utilized the lunar surface as a passive reflector to return VHF signals to earth, and been instrumental in the amateur communications satellite program. His work with the radio Amateur Satellite Corporation (AMSAT) and Project OSCAR (Orbiting Satellite Carrying Amateur Radio) resulted in his participation in the dedication of the National Air and Space Museum, Washington, DC.

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Hiroshi Sawano was born in Hyogo, Japan on February 18, 1952. He graduated from Ono Industrial Engineering High School in 1970.

In the same year he joined the Central Research Laboratory, Mitsubishi Electric Corporation. After being engaged in the development of Gunn diodes, he is now engaged in the research and development of GaAs IMPATT diodes.

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networks.

Richard V. Snyder (S'58-'63) was born in New York on December 14, 1939. He received the B.S.E.E. degree from Loyola University, Los Angeles, CA, in 1961, and the M.S.E.E. degree from University of Southern California, Los Angeles, CA, in 1962.

Since 1973 he has been Vice President-Microwave at Frequency Engineering Laboratories, Farmingdale, NJ, where he is in charge of all microwave product activity. He is engaged in the development of passive and active microwave

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Klaus Schünemann (M'76) was born in Braunschweig, West Germany, on June 17, 1939. He received the Diplom-Ingenieur degree in electrical engineering and the Doktor-Ingenieur degree from Technische Universität, Braunschweig, West Germany, in 1965 and 1970, respectively.

From 1965 to 1970 he was Assistant at the Institut für Hochfrequenztechnik of the Technische Universität Braunschweig, where he was engaged in investigations on frequency multiplication and on diode modeling for switching applications. He has published several papers on these topics. From 1970 to 1971 he was with Valvo GmbH, Hamburg, working in the area of high-power high stable solid-state oscillators. In 1972 he rejoined the Institut für Hochfrequenztechnik of the Technische Universität Braunschweig, where he has been involved in investigations on high-speed modulators for PCM communication systems and on amplification and noise in solid-state oscillators. His current research interests are principally concerned with new technologies for microwave integrated circuits such as fin-line and waveguide-below-cutoff techniques.

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Microwave Associates where he worked on the development of microwave solid-state devices. He joined the University of Kent at Canterbury, Kent, England, in 1967, where he is now leading a research group engaged in projects on solid-state devices and microwave circuits. He is also a Consultant to a number of industrial establishments.

M. I. Sobhy (M'60) received the B.Sc. degree in electrical engineering from the University of Cairo, Cairo, Egypt, in 1956, and the Ph.D. degree from the University of Leeds, Leeds, England, in 1966.

He was a teaching assistant at the Department of Electrical Engineering, the University of Cairo, until 1962, when he joined the University of Leeds first as a research student and later as a Lecturer where he was working on microwave ferrite devices. In 1966, he joined Ltd., Luton, England, as a Research Engineer where he worked on the development of microwave solid-state devices. He joined the University of Kent at Canterbury, Kent, England, in 1967, where he is now leading a research group engaged in projects on solid-state devices and microwave circuits. He is also a Consultant to a number of industrial establishments.

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H. Paul Shuch, formerly an ECM/Reconnaissance Receiver Designer for ITEK's Applied Technology Division, for several years taught electronics courses at West Valley College, Saratoga, CA, and has served as a Senior Engineering Instructor for Lockheed Missiles and Space Company, Sunnyvale, CA, specializing in RF/Microwave Systems. In 1975 he founded MICROCOMM, a small company devoted to the design, development, and manufacture of microwave communications equipment. The downconverter presented here represents one of their major efforts. He is currently on the faculty of San Jose City College, San Jose, CA. He is widely published in

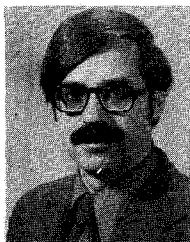


Ross A. Speciale was born in Palermo, Italy, on July 24, 1927. He received the Ph.D. degree in electrical engineering from the Politecnico di Milano, Milan, Italy, in 1955.

From September 1955 to late 1958 he served as Research and Development Engineer at Magneti Marelli, Milan, Italy, where he was involved in the development of microwave radio relay links for TV broadcasting and multiplex telephony. In 1958 he joined the Laben-Branch of Montecatini-Chemicals, where he was involved until 1962 in the development of nuclear-radiation measurement instrumentation and pulse-height analyzers. In 1962 he joined Philips

Gloeilampen Fabrieken N.V. in Eindhoven, The Netherlands, where he served until 1965 in the Isochronous Cyclotron Development Department, and until 1970 in oscilloscope development. In late 1970 he moved to the United States to join Tektronix, Inc., Beaverton, OR, where he has been involved in the development of high-speed subnanosecond circuitry for real-time oscilloscopes, new methods for wide-band high-level linear amplification, and for microwave-network characterization. In 1977 he joined TRW Defense and Space Systems Group's Metrology Department, Redondo Beach, CA, where he is involved in the development of state-of-the-art automated microwave measurement systems. He is holder of patents in the fields of high-frequency accelerating systems for particle accelerators and high-speed high-level waveform generators. He has authored various publications in the fields of accelerator technology, wide-band amplification, and lumped-distributed network analysis and synthesis. He is the originator of various computer-aided design methods and programs.

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Barry E. Spielman (M'71) was born in Chicago, IL, on October 29, 1942. He received the B.S.E.E. degree from the Illinois Institute of Technology, Chicago, in 1964, the M.S.E.E. degree from Pennsylvania State University, University Park, in 1967, and the Ph.D. degree from Syracuse University, Syracuse, NY, in 1971.

From 1964 to 1967 he served as a Research Assistant in the Ionosphere Research Laboratory of the Pennsylvania State University. While studying at Syracuse University he was employed

as an Instructor and Research Assistant. Since 1970 he has been employed at the Naval Research Laboratory, Washington, DC, where he is currently the Head of the Millimeter Techniques Section and Acting Head of the Microwave Module Section.

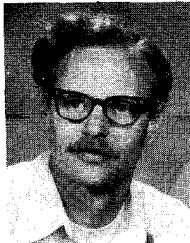
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Leon S. Susman (S'57-M'58-SM'75) was born in Brooklyn, NY, on October 10, 1936. He received the B.E.E. and M.E.E. degrees from the City College of the City University of New York, New York, NY in 1958 and 1962, respectively. In 1969 he received the Ph.D. degree in electrical engineering from the Polytechnic Institute of Brooklyn, Brooklyn, NY.

In 1958 he joined the Applied Electronics Department, Airborne Instrument Laboratories, Melville, NY, where he was engaged in research and development of tunnel diode and parametric amplifiers. In 1961 he joined the Advanced Studies Department at the Sperry Gyroscope Company, Great Neck, NY, where his activities included wideband radar and antenna techniques. Since 1968, he has been a Member of the Technical Staff at the Sperry Research Center, Sudbury, MA., where he has been engaged in various research activities including time-domain techniques, wideband antenna techniques, and microwave metrology.

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Manly P. Weidman was born in Denver, CO, on November 5, 1940. He received the B.S.E.E. degree from the University of Colorado, Boulder, in 1963.

He joined the Martin Marietta Corporation in Denver, CO, in 1963 working on the design, development, and testing of antennas. In 1966 he joined the National Bureau of Standards in Boulder, CO. Since then, he has been involved with the development of reference standards for microwave power measurement in both coaxial and waveguide transmission line. His work also includes the development of measurement techniques and systems for both one- and two-port

parameters from HF to millimeter-wave frequencies. He is currently working with six-port systems for measuring power and reflection coefficient.

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Kenneth P. Weller (S'63-M'69) was born in Paterson, NJ, on October 9, 1942. He received the B.S., M.S., and Ph.D. degrees from the University of California, Berkeley, in 1965, 1966, and 1969, respectively.

Since joining Hughes Aircraft Company in April 1973, he has been concerned with the development of millimeter IMPATT sources and power amplifiers for a variety of applications. He is currently head of the Advanced Component Section in the Torrance Research Center

which is engaged in the development of state-of-the-art solid-state components for microwave and millimeter applications. From 1969 to March 1973, he was on the technical staff at RCA Laboratories in Princeton, NJ. His work at RCA was in the field of fabrication and characterization millimeter-wave solid-state devices, as well as IMPATT oscillator and amplifier circuit development.

Dr. Weller is a member of Phi Beta Kappa, Tau Beta Pi, Eta Kappa Nu, and Sigma Xi.

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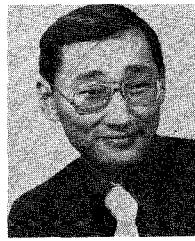


Albert E. Williams (S'66-M'66) was born in Albany, Australia, on March 27, 1940. He received the B.E. degree in electrical engineering from the University of Western Australia, Nedlands, Australia, in 1962, and the Ph.D. degree from University College, London, England, in 1966.

From 1966 to 1968 he was a Lecturer in the Department of Electrical Engineering, University of Western Australia. Currently, he is a Technical Staff Member of the Transponders Department, RF Transmission Laboratory, COMSAT Laboratories, Clarksburg, MD, where he is actively engaged in the development of advanced transponder designs for satellite communication systems.

Dr. Williams was a joint recipient of the Institution of Electrical Engineers (London) Sylvanus P. Thompson Premium award in 1966.

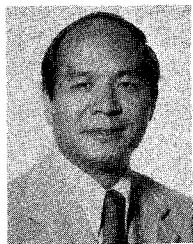
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Robert S. Ying (M'67) was born in Shanghai, China, on April 15, 1942. He received the B.S.E.E. degree in 1964 and the M.S. degree in 1966, both from the University of Michigan, Ann Arbor.

He joined Hughes Aircraft Company, Torrance, CA, in 1966 as a Member of the Technical Staff in the Research Laboratories, where he has been actively engaged in the research and development of solid-state microwave and millimeter-wave devices such as IMPATT, TRAPATT, and Gunn diodes. Since 1973 he has been Assistant Manager in the Torrance Research Center at Hughes, directing a materials and processing group to develop GaAs and silicon devices. In 1977 he joined the Electron Dynamics Division as Senior Scientist engaging in millimeter-wave component and system development.

Mr. Ying is a member of Eta Kappa Nu.



Lloyd T. Yuan received the B.S. degree in electrical engineering from National Taiwan University, Taipei, Taiwan, in 1957, the M.S. degree in electrical engineering from Stanford University, Stanford, CA, in 1962, and the Ph.D. degree in materials science from the University of Southern California, Los Angeles, CA, in 1970.

From 1962 to 1966 he was a Project Engineer at Consolidated Electrodynamics Corporation and engaged in the development of a number of solid-state devices using Si and III-V compound

semiconductor materials. He was a Research Assistant at the University of Southern California, from 1966 to 1970, where he developed the technologies for the fabrication of a variety of GaAs devices. In 1970 he joined the Microwave Department of Aerojet Corporation, where he was Engineering Supervisor, responsible for the development of microwave semiconductor devices and circuits technology. In 1973 he joined the Microwave Technology Department of TRW Systems Group, Redondo Beach, CA, where he is in charge of millimeter-wave components development. He holds two patents and has one patent pending, and is the author and co-author of several technical papers.

Dr. Yuan is a member of Sigma Xi.