

The Gunn oscillator normally supplied with the parametric amplifier performed slightly better than the best adjusted IMPATT. It is anticipated that the use of IMPATT pumps for parametric amplifiers will usually be restricted to the range of pump frequencies above 50 GHz, where inadequate power is obtainable from Gunn oscillators and more than enough power can be obtained from IMPATT oscillators. In this range of pump frequencies the added cost and complexity of pumps using Gunn oscillators and frequency multipliers can be saved by substitution of GaAs IMPATT pumps with little or no penalty in noise performance in the presence of strong input signals.

REFERENCES

- [1] W. A. Porter, D. I. Breitner, and B. Smilowitz, "Pump noise transfer in parametric amplifiers," *IEEE Trans. Microwave Theory Tech.*, vol. MTT-22, pp. 894-896, Oct. 1974.
- [2] N. D. Kenyon, "A circuit design for mm-wave IMPATT oscillators," presented at the IEEE G-MTT Int. Microwave Symp., May 1970.
- [3] F. M. Magalhaes and K. Kurokawa, "A single-tuned oscillator for IMPATT characterization," *Proc. IEEE (Lett.)*, vol. 58, pp. 831-832, May 1970.
- [4] H. A. Wheeler and H. Schweibert, "Step-twist waveguide components," *IRE Trans. Microwave Theory Tech.*, vol. MTT-3, pp. 44-52, Oct. 1955.
- [5] B. C. DeLoach, Jr., "Step-twist-junction waveguide filters," *IRE Trans. Microwave Theory Tech.*, vol. MTT-9, pp. 130-135, Mar. 1961.
- [6] C. A. Brackett, "The elimination of tuning-induced burnout and bias-circuit oscillations in IMPATT oscillators," *Bell Syst. Tech. J.*, vol. 52, p. 271, 1973.
- [7] P. A. Levine, H. C. Huang, and H. Johnson, "IMPATTs shoot for Gunn noise levels," *Microwaves*, vol. 52, Apr. 1972.
- [8] J. Chramiec, "Effect of pump noise and interfering signal in parametric amplifiers," *Proc. IEEE (Lett.)*, vol. 60, p. 149, Jan. 1972.
- [9] R. J. Wagner, W. W. Gray, and A. Luber, "The use of IMPATT generated power for parametric amplifier pumps," presented at the IEEE Int. Solid-State Circuit Conf., Feb. 1971.
- [10] Hewlett-Packard Application Note 935, p. 28.

Contributors



James L. Allen (S'57-M'62) was born in Graceville, Fla., on September 25, 1936. He received the B.E.E., M.S.E.E., and Ph.D. degrees in electrical engineering, all from the Georgia Institute of Technology, Atlanta, in 1959, 1961, and 1966, respectively.

Since 1959 he has worked in a variety of microwave areas, including radar antennas, ferrimagnetic materials and devices, filters, and computer-aided design. His employment history includes positions with the Georgia

Institute of Technology, Atlanta, Sperry Microwave Electronics Company, Clearwater, Fla., and Colorado State University. Since September 1972 he has been with the University of South Florida, Tampa, where he is currently Professor of Electrical and Electronic Systems. His current research areas include new transmission-line structures, microwave filters, and ferrite devices.



Francisco J. Bernues (M'74) was born in Sabiñánigo, Spain, in 1944. He received the degree of Ingeniero de Telecomunicación from the Escuela Técnica Superior de Ingenieros de Telecomunicación, Madrid, Spain, in 1968, and the M.S. and Ph.D. degrees in electrical engineering from Brown University, Providence, R. I., in 1971 and 1973, respectively.

In 1973, he joined Hughes Aircraft Company, Torrance, Calif., where he is currently a Member of the Technical Staff. He is engaged in the design and development of millimeter wave ferrite devices, mixers, and subsystems.

Dr. Bernues is a member of Sigma Xi.



Donald M. Bolle (S'56-M'57-SM'66) was born in Amsterdam, The Netherlands, on March 30, 1933. He received the B.Sc. degree with honors in electrical engineering from Kings College, Durham University, England, in 1954, and the Ph.D. degree in electrical engineering from Purdue University, West Lafayette, Ind., in 1961.

From 1954 to 1955 he was a Research Engineer with the Electrical Musical Industries, Middlesex, England. He taught at Purdue University from 1956 to 1962, first as an Instructor, then as an Assistant Professor in Electrical Engineering. He spent the academic year 1962 to 1963 in the Department of Applied Mathematics and Theoretical Physics, Cambridge University, England, as an NSF Postdoctoral Fellow. In 1963 he joined Brown University, Providence, R. I., where he is presently Professor of Engineering. He was a Visiting Professor at the Institute for High Frequency Techniques of the Technical University of Braunschweig, Germany, 1967, and at the University of Colorado, Boulder, in 1972. His research interests lie in electromagnetic propagation, radiation, and scattering.

Dr. Bolle is a member of Eta Kappa Nu, Tau Beta Pi, Sigma Xi, The American Society for Engineering Education, and the American Association of University Professors.

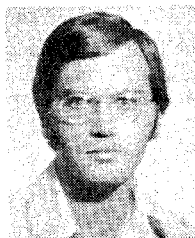


Kun-Mu Chen (SM'64) was born in Taipei, Taiwan, China, on February 3, 1933. He received the B.S.E.E. degree from the National Taiwan University, Taipei, in 1955, and the M.S. and Ph.D. degrees in applied physics from Harvard University, Cambridge, Mass., in 1958 and 1960, respectively.

While at Harvard University, he held the C. T. Loo and the Gordon McKay Fellowships. From 1956 to 1957 he was a Teaching Assistant at the National Taiwan University,

and from 1959 to 1960 he was a Research Assistant and Teaching Fellow at Harvard University. From 1960 to 1964 he was associated with the Radiation Laboratory, University of Michigan, Ann Arbor, where he was engaged in studies of electromagnetic theory and plasma. In 1962, while on leave from the University of Michigan, he was a Visiting Professor of Electronics at Chao-Tung University, Taiwan. Since 1964 he has been with Michigan State University, East Lansing, first as Associate Professor of Electrical Engineering, and since 1967 as Professor of Electrical Engineering and Engineering Research. From 1968 to 1973 he was the Director of the Electrical Engineering program of the Department of Electrical Engineering and Systems Science.

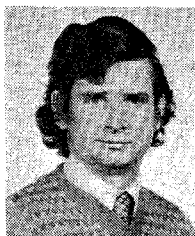
Dr. Chen is a member of U. S. Commission VI of the International Scientific Radio Union, Sigma Xi, the American Association for the Advancement of Science, and the American Association of University Professors.



Christopher L. Christman (S'68-M'71) was born in Bridgeport, Conn., on October 12, 1947. He received the B.S.E.E. degree from Lehigh University, Bethlehem, Pa., in 1969, and the M.S.E.E. degree from the University of Illinois, Urbana, in 1970.

From 1970 until 1971 he worked in the Nuclear Electrical Design Group for the U. S. Navy at Mare Island Naval Ship Yard in Vallejo, Calif. In 1971 he received his commission in the U. S. Public Health Service,

and since then has worked in the Dosimetric Studies Section of the Division of Biological Effects, Rockville, Md.



Philadelphia.

Joseph M. Cusack received the B.A. degree in physics from Bowdoin College, Brunswick, Me., in 1972.

He joined the David Sarnoff Research Center, RCA Laboratories, Princeton, N. J., in December 1972 as a Research Associate. Since then he has worked in the area of computer automation of microwave and infrared measurements. He is currently pursuing graduate work in Systems Engineering at the University of Pennsylvania,



Brooks C. Dodson, Jr. (M'73) was born in Danville, Va., on October 23, 1926. He received the B.E.E. degree from the University of Florida, Gainesville, in 1950. Subsequently, he has completed graduate-level courses at several universities, most recently at George Washington University, Washington, D. C.

Between college graduation and 1971 he was employed in industry as a Design Engineer, Program Director, and Branch Manager. His field of endeavor has been primarily

radar and associated microwave subsystems and circuitry. Former employers include the Bendix Corporation, Sperry Microwave Electronics Company, and Texas Instruments. Since 1971 he has been employed at the Naval Research Laboratory, Washington, D. C. He is presently Head of the Components and Techniques Development Section of the Space System Division. His current activities include the development, test, and evaluation of solid-state, microwave integrated circuit, transceiver modules for array radars and bipolar microwave power transistor reliability.

Mr. Dodson is a member of PGMT and Sigma Tau.



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

After employment with the U. S. Naval Ordnance Laboratory and Applied Physics Laboratory, Johns Hopkins University, Baltimore, Md., he joined the National Bureau of

Standards in 1954, and is now Senior Research Scientist, Electromagnetics Division, Boulder, Colo. His special field of research competence is microwave measurement standards and techniques.

Dr. Engen is the author of more than 30 published papers in the field of microwave measurements, holds two patents, and was awarded the Department of Commerce Silver Medal for Meritorious Service in 1960. He is a member of Commission I of the International Scientific Radio Union.



Paul T. Greiling was born in Cleveland, Ohio, on October 19, 1939. He received the B.S. degree in electrical engineering, the B.S. degree in mathematics, and the M.S.E. and Ph.D. degrees, all from the University of Michigan, Ann Arbor, in 1963, 1964, and 1970, respectively.

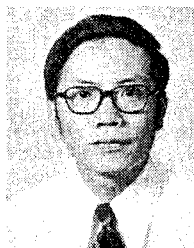
From 1970 to 1972, he was an Assistant Professor in the Department of Electrical Engineering, Northeastern University, Boston, Mass., and a consultant for the Lincoln

Laboratory, Massachusetts Institute of Technology, Lexington. Since 1972 he has been an Assistant Professor in the Electrical Sciences and Engineering Department, University of California, Los Angeles, and a consultant for local industry.

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



George I. Haddad (S'57-M'61-SM'66-F'72), for a photograph and biography, please see page 78 of the January 1974 issue of this TRANSACTIONS.



Henry S. Ho (S'60-M'61) was born in Fukien, China, on September 8, 1942. He received the B.S., M.S., and Ph.D. degrees in electrical engineering from the University of Washington, Seattle, in 1965, 1967, and 1970, respectively.

He was a Research Assistant from 1965 to 1966, a Teaching Assistant from 1966 to 1967, and a Predoctoral Research Associate from 1967 to 1970, all at the University of Washington, where he also did postdoctoral research. Since 1971 he has been engaged in dosimetric research in microwave biological effect experiments at the Bureau of Radiological Health, Food and Drug Administration, Rockville, Md. His current research interests include theoretical and experimental dosimetric studies of biological and phantom tissues.

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



Ichiro Ikushima (S'68-M'70) was born in Kobe, Japan, on August 27, 1945. He received the B.E. and the M.E. degrees in electrical engineering from Kobe University, Kobe, Japan, in 1968 and 1970, respectively.

In 1970, he joined the Central Research Laboratory, Hitachi, Ltd., Tokyo, Japan. He has been working on ferrite devices, especially on circulators.

Mr. Ikushima is a member of the IECE of Japan.



Ernest L. Komarek (M'71) was born in Chicago, Ill., on March 3, 1926. He received the B.S. degree in engineering physics from the University of Colorado, Boulder, in 1965.

Upon completing his undergraduate studies, he joined the Central Radio Propagation Laboratory, National Bureau of Standards, Boulder, Colo., 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.

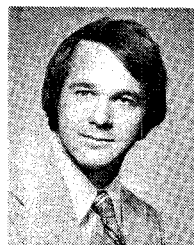


Richard W. Laton (S'65-M'66-S'70-M'71) was born in Springfield, Illinois, on October 31, 1937. He received the B.S. degree from the United States Naval Academy, Annapolis, Md., in 1959, and the M.S.E. and Ph.D. degrees in electrical engineering from the University of Michigan, Ann Arbor, in 1965 and 1973, respectively.

From 1959 to 1969 he served on active duty in the U. S. Navy and was involved in the construction of Navy shore facilities.

From 1970 to 1972 he was employed by the Electron Physics Laboratory, University of Michigan, Ann Arbor, doing research on properties of IMPATT devices in applications as microwave amplifiers. Since 1972 he has been a staff member at the Lincoln Laboratory, Massachusetts Institute of Technology, Lexington, engaged in research and development of solid-state microwave power devices for array radars, including transistor, IMPATT, and TRAPATT power amplifiers.

Dr. Laton is a member of Tau Beta Pi and is a registered Professional Engineer in the State of North Carolina.



Donald E. Livesay (S'71-M'74) was born in Flint, Mich., on February 4, 1947. He received the B.S. and M.S. degrees in electrical engineering from Michigan State University, East Lansing, in 1969 and 1970, respectively. He is currently completing the Ph.D. degree requirements in electrical engineering at Michigan State.

From 1970 to 1973 he held a National Science Foundation Graduate Traineeship.

In addition to biological effects of microwaves, his interests include antennas, scattering, and propagation. Mr. Livesay is a member of Eta Kappa Nu and Tau Beta Pi.



Minoru Maeda (M'70) was born in Kanagawa, Japan, on December 22, 1942. He received the B.S. and M.S. degrees in electrical engineering from Yokohama National University, Yokohama, Japan, in 1965 and 1967, respectively.

He joined the Central Research Laboratory, Hitachi, Ltd., Tokyo, in 1967, and has since been engaged in research and development on millimeter-wave parametric amplifiers, microwave-integrated circuits, and lumped-element circulators. He is presently working on microwave application of GaAs FET's.

Mr. Maeda is a member of the IECE of Japan.



Nino A. Masnari (S'61-M'65-SM'70) was born in Three Rivers, Mich., on September 20, 1935. He received the B.S., M.S., and Ph.D. degrees in electrical engineering from the University of Michigan, Ann Arbor, in 1958, 1959, and 1964, respectively.

He was employed with the Electron Physics Laboratory of The University of Michigan from 1957 to 1967 during which time he did research on electron beams, microwave tubes, and microwave measurements. In 1967 he joined the General Electric Research and Development Center in Schenectady, N. Y., as a Research Engineer in the plasma physics branch. His work at General Electric included plasma physics, high-

current metal-vapor arcs, and cathode-spot phenomena. Since 1969 he has been an Associate Professor of Electrical Engineering and a member of the Electron Physics Laboratory at The University of Michigan. His present research activities involve the fabrication, testing, and evaluation of solid-state materials and devices. He has developed an ion implantation facility which is being used for studying the characteristics of implanted layers in semiconductor materials.

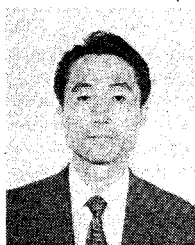
Dr. Masnari is a member of Sigma Xi, Tau Beta Pi, Eta Kappa Nu, and Phi Kappa Phi.



Paul J. Meier (S'55-M'59-SM'69) was born in New York, N. Y., on April 10, 1936. He received the B.E.E. degree from Manhattan College, New York, in 1958 and the M.S. degree from Long Island University, Brookville, N. Y., in 1969.

From 1958 to 1965 he was a Development Engineer, and later a Senior Development Engineer, at Wheeler Laboratories, Great Neck, N. Y. There his work included the study of dielectric-lined and periodically loaded circular waveguides and their application to phased-array radiators and polarization converters. In 1966 he joined AIL, a Division of Cutler-Hammer, Melville, N. Y., where, as a Project Engineer in the Radar Techniques Department, he was responsible for the development of phased-array antenna elements and ferrite phase shifters. Later at AIL he served as a Project Engineer in the Applied Electronics Division on programs directed toward the development of a high-power solid-state switch, an integrated sweeping receiver, and a multibeam millimeter communication system. He is currently a Consultant in the Advanced Microwave Systems Departments engaged in the development of millimeter integrated circuits.

Mr. Meier is a member of Eta Kappa Nu and is a Past-Chairman of the N. Y., Long Island Chapter of the MTT Committee.



Yasuo Minai was born in Chiba, Japan, on June 17, 1943. He received the B.E. and M.E. degrees from Yokohama National University, Yokohama, Japan, in 1967 and 1970, respectively.

He joined the Central Research Laboratory, Hitachi, Ltd., Tokyo, in 1970. He has since been engaged in research and development of microwave amplifiers with bipolar transistors and FET's.

Mr. Minai is a member of the IECE of

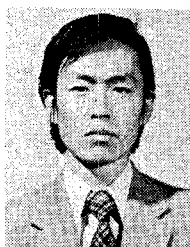
Japan.



Shigemichi Nagano (M'71) was born in Shizuoka, Japan, on February 2, 1939. He graduated from the Department of Electronics Engineering, Shizuoka University, Shizuoka, Japan, in 1961.

In 1961 he joined the Central Research Laboratories, Nippon Electric Company, Kawasaki, Japan, and worked on millimeter-wave backward-wave oscillators and infrared detectors. He is now working on microwave and millimeter-wave solid-state oscillators.

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



Shuji Ohnaka was born in Ehime, Japan, on November 21, 1950.

In 1969 he joined the Nippon Electric Company, Kawasaki, Japan. He has participated in the development of microwave and millimeter-wave solid-state oscillators at NEC's Central Research Laboratories.

Mr. Ohnaka is an associate member of the Institute of Electronics and Communication Engineers of Japan.



Barry S. Perlman (M'65-SM'71) received the B.E.E. degree from the College of the City of New York, New York, N.Y., in 1961, and the M.S.E.E. degree and the Ph.D. degree in electrophysics from Brooklyn Polytechnic Institute, Brooklyn, N.Y., in 1964 and 1973, respectively.

From 1961 to 1968 he was a Member of the Staff of the RCA Advanced Communications Laboratory in New York City, becoming a Senior Member of the Technical Staff in 1966. He was primarily concerned with advanced receiver techniques such as the development of all-solid-state microwave troposcatter and relay subsystems, airborne X-band receivers, integrated circuits, high level parametric circuits, dielectric and superconducting microwave filters, and fabrication and application of Si avalanche devices. In June of 1968 he joined the Microwave Technology Center at the David Sarnoff Research Center, RCA Laboratories, Princeton, N.J., as a Member of the Technical Staff, where he has worked on the microwave applications of active GaAs semiconductors and is presently involved with computer-aided design (CAD) and automated measurement techniques. He has published more than 30 technical papers in the field of solid-state devices, microwave networks, and CAD, and has made 15 patent disclosures with 5 awarded. In 1969 he received an engineering achievement award for his part in the development of advanced microwave devices, and in 1970 he was the recipient of the RCA Laboratories Outstanding Achievement Award for a team effort in the development of wide-band GaAs transferred electron amplifiers.

Dr. Perlman is a member of Sigma Xi, the IEEE Microwave Theory and Techniques Society, the IEEE Electron Devices Group, and he is a Professional Engineer in New York State. He is a member of the Technical Program Committee and Associate Editor and chairman of the subcommittee on computer oriented practices (MTT-1) of the Microwave Theory and Techniques Society of the IEEE.



Stewart M. Perlow (S'60-M'73) received the B.E.E. degree from the College of the City of New York, New York, N.Y., in 1963, and the M.S.E.E. degree from the Polytechnic Institute of Brooklyn, Brooklyn, N.Y., in 1970.

From 1963 to 1967, he was employed by RCA's Advanced Communications Laboratory in New York as a Member of the Technical Staff. In 1967 he left RCA to become a cofounder of National Electronics Laboratories. Upon acquisition of National

Electronics Laboratories by Harvard Industries, he became a Project Manager and subsequently Chief Engineer at KMC Semi-

conductor Corporation, a division of Harvard Industries. His work has been in the field of microwave solid-state devices and ultralow noise UHF amplifiers. In January of 1973 he joined the David Sarnoff Research Center, RCA Laboratories, Princeton N.J., as a Member of the Technical Staff. He is presently involved in UHF and microwave work on ceramic substrates. He is the author of various technical papers.

Mr. Perlow is a member of Eta Kappa Nu.



George Pfund (M'73) was born in Hallau, Switzerland, in 1937. He received a Diploma in electronics from the Onken Engineering College, Switzerland, in 1958.

He joined the Hewlett-Packard Company, HPA Division, Palo Alto, Calif., in 1966 as an Electronics Technician. He became an Associate Engineer at Microwave Associates West, Sunnyvale, Calif., in 1969. He returned to Hewlett-Packard in the fall of 1969, where he was initially concerned with the testing

and characteristics of light-emitting diodes. During the last several years he has been involved with the development and testing of both single- and double-drift silicon IMPATT diodes. His recent activity has been concerned with double-drift IMPATT diodes for high-power pulsed applications.



Allen Podell was born in Wilmington, Del., on January 24, 1938. He received the B.S. degree in engineering physics from Cornell University, Ithaca, N. Y., in 1960.

He was founder of Anzac Electronics in July 1960, where he worked on the development of multidecade microwave components, including single-balanced and double-balanced mixers, magic T and quadrature hybrids, directional couplers, impedance transformers, phase shifters, and power combiners.

He went to Tanzania for two years in the U. S. Peace Corps as a Road Engineer. He returned to work on MIC components, including low-distortion and high-power amplifiers, high directivity couplers, attenuators, switches, and phase shifters. In 1970 he went to SRI, where he designed and constructed wide-band 5–20-GHz MIC components, e.g., a 3-dB quadrature hybrid, a 20-dB high-directivity coupler, digital phase shifters, and transfer switches. Also at SRI he helped design two new types of microwave acoustic transducer, and a nondispersive acoustic variable delay line. At SRI he designed a limited-bandwidth negative-impedance converter for microwave applications. In 1972 he went to Hewlett-Packard, Palo Alto, Calif., where he has been working on matching networks for IMPATT diodes and microwave transistors. He holds about 20 patents.



William W. Raukko (S'64–M'67) was born in Baltimore, Md., on October 6, 1942. He received B.Eng.Sci. degree from The Johns Hopkins University, Baltimore, Md., in 1964, and the M.S.E.E. degree from Lehigh University, Bethlehem, Pa., in 1965.

From September 1965 to November 1967 he was with Westinghouse Electric Corporation, Baltimore, Md., and was engaged in the design of microwave filters, couplers, and frequency converters. In 1967 he joined Aertech

Industries, Sunnyvale, Calif., where he served as Engineering Section Manager and was involved in the design of microwave signal processing networks and microwave frequency converters. In April 1972 he joined the Hewlett-Packard Company, Palo Alto, Calif., and is currently Project Supervisor for the portable microwave repeater.

Mr. Raukko is a member of the Microwave Theory and Techniques Society and the Engineering Management Society. He is a founder of the Professional Activities Committee of the San Francisco Section of the IEEE, and has been elected chairman for the coming year. He is a member of the United States Activities Committee of the IEEE.



Chung-Li Ren was born in Chefoo, China, on June 1, 1931. He received the B.S. degree from the Taiwan College of Engineering, Taiwan, China, the M.S. degree from the University of Notre Dame, Ind., both in electrical engineering, and the Ph.D. degree in electrophysics from the Polytechnic Institute of Brooklyn, N. Y., in 1953, 1957, and 1964, respectively.

From 1957 to 1959, he was a Senior Research Fellow at the Polytechnic Institute of Brooklyn. In 1960, he became a Senior Graduate Assistant at the Microwave Research Institute of the Polytechnic Institute where he was engaged in research on wave propagation and scattering in the multimode waveguides and other related topics in electromagnetic theory. He was also a Lecturer in the Department of Electrical Engineering at the same institute. Since 1965, he has been with the Bell Telephone Laboratories, Inc., North Andover, Mass., where he has been concerned with the theory and development of microwave filters and solid-state components for the microwave radio as well as the millimeter wave waveguide transmission system.

Dr. Ren is a member of Sigma Xi.



Boris Sheleg (M'70) was born in Stratford, Conn. He received the A.B. degree in 1956 and the A.M. degree in 1958, both in physics, from Clark University, Worcester, Mass.

In 1958 he joined the Microwave Antennas and Components Branch of the Naval Research Laboratory, Washington, D. C., where he became engaged in the design, development, and evaluation of a variety of microwave antennas, feed networks for electronically scanned arrays, and strip transmission-

line components. In 1968 his interest turned to multibeam conformal arrays and he made a developmental study of the Butler matrix-fed circular array for continuous scanning. He is currently in the Microwave Techniques Branch of the Naval Research Laboratory, performing developmental work on passive microstrip components for systems application.

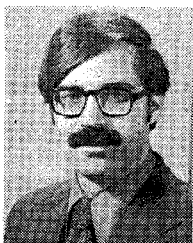


Craig P. Snapp (S'66–M'66) was born in Lima, Ohio, in 1944. He received the B.S. degree in engineering science from Case Western Reserve University, Cleveland, Ohio, in 1966, and the Ph.D. degree in applied physics from Cornell University, Ithaca, N. Y., in 1971.

His thesis and postdoctoral research at Cornell was mainly concerned with the trapped-plasma mode in silicon avalanche diodes. During the spring term of 1971, he

was a part-time Instructor in the Department of Electrical Engineering at Cornell. In the fall of 1971 he joined the Microwave Institute Foundation of the Royal Institute of Technology, Stockholm, Sweden, as a Guest Scientist. His research activities at the Microwave Institute were involved with barrier-injection transit-time devices. In the spring of 1973 he joined the Hewlett-Packard Company, HPA Division, Palo Alto, Calif., and was initially concerned with the design and development of a family of double-drift silicon IMPATT diodes. His present activity is involved with the design and process technology of silicon bipolar microwave transistors. He has recently become an Associate Editor of the IEEE TRANSACTIONS ON ELECTRON DEVICES.

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



Barry E. Spielman (M'71) was born in Chicago, Ill., 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, N. Y., 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 as a Research Electronics Engineer at the Naval Research Laboratory, Washington, D. C.



Paul G. Tipon received the B.S.E.E. degree from the University of Southern California, Los Angeles, in 1966.

He was with the Philco-Ford Western Development Laboratory, where he designed sophisticated satellite microwave links. He is now a Project Engineer for Microwave-Frequency Synthesizers with Systron-Donner Corporation, Concord, Calif., and is the Development Engineer responsible for the new technique in microwave synthesis.



Robert J. Trew (S'71) was born in Saginaw, Mich., on December 8, 1944. He received the B.E.E. degree from General Motors Institute, Flint, Mich., in 1968, and the M.S.E. degree from the University of Michigan, Ann Arbor, in 1969.

From 1969 to 1970 he was employed by the Space Physics Research Laboratory of the University of Michigan where he was involved in measurement studies of ionospheric radiation. He joined the Electron Physics

Laboratory of the University of Michigan in 1971 where he is presently completing the requirements for the Ph.D. degree in the area of avalanche transit-time devices, specifically in the area of TRAPATT mode oscillators.

Mr. Trew is a member of Tau Beta Pi, Eta Kappa Nu, and Sigma Xi.



Peter V. Tryon was born in Ossining, N. Y., on July 1, 1941. He received the B.S. degree in electrical engineering from Pennsylvania State University, University Park, in 1963, the M.S. degree in electrical engineering from New York University, New York, in 1965, and the Ph.D. degree in statistics from Pennsylvania State University, in 1970.

From 1963 to 1965 he was a Member of the Technical Staff at Bell Laboratories, Whippany, N. J., and from 1965 to 1970 he was a

Member of the Technical Staff at the Ordnance Research Laboratory, Pennsylvania State University, where he was engaged in signal processing development for sonar systems. In 1970 he joined the Statistical Engineering Laboratory, National Bureau of Standards, as a statistical consultant at the Department of Commerce, Boulder, Colorado Laboratories. He is also a Visiting Lecturer in mathematics at the University of Colorado, Boulder. He is currently concerned with the application of modern statistical methods in the physical sciences and metrology.



Arpad D. Vincze (S'61-M'74) was born in Hungary on April 12, 1935. He received the B.S. and M.S. degrees, both in electrical engineering, from the University of Santa Clara, Santa Clara, Calif., in 1962 and 1967, respectively. He also spent three years studying preparatory electronics at the Puskas Tivadar Telecommunications Technikum, Budapest, Hungary, and one year doing postgraduate course work in semiconductor electronics at Stanford University, Stanford, Calif.

From 1962 to 1965 he worked at Sylvania Electronics Systems as a Designer of ECM hardware; during this time he was also a part-time Consultant at Sigma Company, Los Altos, Calif., where he participated in the evaluation of the analog and digital guidance system of the first generation Polaris missile. From 1965 to 1966 he was employed by Energy Systems Company. There he was in charge of the design and development of a 191-channel broad-band solid-state telemetry/command data transmitter for the Apollo tracking ship. In 1966 he joined Philco Western Development Laboratories, Philco-Ford Company, Palo Alto, Calif., where he has been employed to date. There he was in charge of the design and development of thick/thin film hybrid circuits in various satellite and deep space programs. These included front ends and other components for microwave receivers, power amplifiers, very linear phase modulators, frequency multipliers, parametric upconverters, and computer aided design techniques applicable to communication circuits and systems. He participated in the development of Mariner Mars '69 and, recently, the Viking 1975 Mars Lander deep space probes. Currently at Philco-Ford he is involved in various study programs and developments of communications transponders for both satellite and deep space applications. His responsibilities are to improve existing hardware and develop new circuitry by utilizing computer aided design and other state-of-the-art techniques for microwave integrated circuits and systems. He has presented and published several papers in the field of communication circuits and has a patent pending.

Mr. Vincze is a member of Tau Beta Pi and the Electronic Design Author's Club.



Han-chiu Wang was born in Chekiang, China, on May 27, 1932. He received the B.S.E.E. degree from the Cheng Kung University, Taiwan, China, the M.S.E.E. degree from the University of Notre Dame, Notre Dame, Ind., and the Ph.D. degree in electrophysics from the Polytechnic Institute of Brooklyn, N. Y., in 1955, 1960, and 1963, respectively.

From 1956 to 1958, he was with the Chinese Government Radio Administration,

Taiwan. As a Research Fellow and later a Research Associate at the Polytechnic Institute of Brooklyn, he did research in wave propagation and scattering on periodic structures, from 1960 to 1965. He then joined the Bell Telephone Laboratories, Inc., North Andover, Mass., where he has been engaged in the development of microwave and millimeter wave components for various transmission systems.



Wesley H. Weisenberger (M'74) received the Ph.D. degree in 1971, doing his thesis work on ion-implantation damage studies in Si and GaAs.

He joined TRW Semiconductors in 1965 in the microwave-power-transistor design group and later was Manager of Capacitor Development. He joined the Naval Research Laboratory, Washington, D. C., in 1971, where he is currently Head of the Transistor Physics Section of the Electronics Division.

He has worked in the Ion Implantation Section and was Manager of the Physics of Failure Program in 1972. He currently heads programs in microwave-power-transistor physics of failure, advanced diagnostics development, thermal analysis, and failure analysis for power transistors. In addition he is Scientific Officer for outside contract work on ion-implanted microwave transistors and consults for the Space System Division on microwave-transistor accelerated life-test programs.

Dr. Weisenberger is an associate member of Working Group A (Mainly Microwave Devices) of the Advisory Group on Electron Devices (AGED) and is a member of the American Physical Society.



Jerald A. Weiss (SM'61) was born in Cleveland, Ohio, on June 9, 1922. He received the B.A. and M.A. degrees in physics, in 1949, and the Ph.D. degree in physics, in 1953, from Ohio State University, Columbus.

From 1953 to 1960 he was a Member of the Technical Staff at Bell Laboratories, Inc., Murray Hill, N. J., engaged in ferrite device development. In 1958 he was made Supervisor of his ferrite device group. In 1960 he joined in the founding of Hyletronics Corporation,

engaged in the development of microwave solid-state components and subsystems. In 1962 he was appointed to the faculty of the Department of Physics at Worcester Polytechnic Institute, Worcester, Mass., where he now holds the position of Professor of Physics. Since 1962 he has also served as Consultant to the Lincoln Laboratory, Massachusetts Institute of Technology, Lexington,

where he has been concerned with phased-array components and principles and other microwave problems.

Dr. Weiss is a member of the Editorial Board of the IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES and is a member of the American Physical Society, Phi Beta Kappa, and Sigma Xi.



Gerard T. Wrixon was born in Limerick, Ireland, on May 25, 1940. He received the B.E. degree with honors, from the National University of Ireland, Cork, the M.Sc. degree from the California Institute of Technology, Pasadena, and the Ph.D. degree from the University of California, Berkeley, all in electrical engineering, in 1961, 1964, and 1969, respectively.

From 1961 to 1963, he was with Fokker, the Royal Netherlands Aircraft Factory, Amsterdam, as a Research and Development Engineer, specializing in the field of aircraft navigational systems. From 1964 to 1965, he was an Instructor in the Electrical Engineering Department at Loyola University, Los Angeles, Calif. While a graduate student at the University of California, Berkeley, he served as a Research Assistant in the Radio Astronomy Laboratory and Acting Instructor in the Electrical Engineering Department. From 1969 to 1974, he was a Member of the Technical Staff at the Crawford Hill Laboratory, Bell Telephone Laboratories, Inc., Holmdel, N. J. He is currently Lecturer in Electrical Engineering at University College, Cork, Ireland. His main interests are in the fields of millimeter wave receivers and radio astronomy.

Dr. Wrixon is a member of Commission V of the International Scientific Radio Union, the American Astronomical Society, and the International Astronomical Union.



Sheppard Yarrow was born in Philadelphia, Pa., on October 2, 1942. He received the B.A. degree in mathematics from Temple University, Philadelphia, in 1964.

He was employed as a Computer Programmer with the International Business Machines Corporation from 1965 to 1968. In 1968 he was commissioned into the U. S. Public Health Service, Rockville, Md. He currently holds the rank of Lieutenant Commander and is involved in the integration of minicomputers and large-scale data-processing systems with experimental facilities designed to evaluate biological effects due to ultrasonic and microwave radiation.