

# Authors

## Ori Bar-Gadda

*Data Systems Division, East Fishkill, New York*

Mr. Bar-Gadda is working in the device modeling and design area at the East Fishkill laboratory, where he joined IBM in 1978. He received a B.S.E.E. from Cooper Union, New York, New York, in 1973, an M.S.E. in 1974, and an M.A. in 1975, both from Princeton University. He is presently a candidate for a Ph.D. degree in electrical engineering at Princeton University.

## Arup Bhattacharyya

*Research Division, Yorktown Heights, New York*

Dr. Bhattacharyya is manager of the advanced process development group. He is currently working on silicon technology development for VLSI. He joined IBM's Components Division development laboratory in Burlington, Vermont, in 1968 as a staff engineer and worked in various capacities in interconnection technology, thin films and silicon process, device and circuit technology development. Prior to joining IBM, he worked from 1966 to 1968 on magnetic thin film sensors and spring material development at the Foxboro Co., Foxboro, Massachusetts. He received his B.S. in engineering from the University of Calcutta, India, in 1960, and his Ph.D. in metallurgy from the University of Pennsylvania, Philadelphia, in 1966. He has received two IBM Invention Awards for his contribution in silicon process and device technology. Dr. Bhattacharyya is a member of the Institute of Electrical and Electronics Engineers.

## Eugene M. Blaser

*Data Systems Division, East Fishkill, New York*

Mr. Blaser received the B.S.E.E. and M.S.E.E. degrees from Case Institute of Technology in Cleveland, Ohio, in 1967 and 1971. From 1967 to 1969, he worked for Honeywell Aerospace in Minneapolis, Minnesota. He was involved in the development of a solid-state silicon pressure sensor for avionics systems and digital air data computers. In 1971, he joined IBM in the Advanced Systems Development Division. He worked on the development of NMOS logic chips for microprocessor applications. He was also involved in applying these chips to a variety of systems applications. More recently, he has been working on developing FET logic masterslices, PLA designs, and custom memory designs. His present work involves the study and assessment of the effects of alpha particles on LSI designs. Mr. Blaser is a member of the Institute of Electrical and Electronics Engineers.

## Douglas C. Bossen

*Data Systems Division, Poughkeepsie, New York*

Dr. Bossen is a senior engineer in Poughkeepsie, where he joined IBM in 1968. He has general responsibility for advanced reliability and maintenance techniques, including error correcting codes, error detection mechanisms, and fault isolation techniques. He received the B.S. degree in electrical engineering in 1964, the M.S. degree in electrical engineering in 1966, and the Ph.D. degree in electrical engineering in 1968, all from Northwestern University, Evanston, Illinois. Dr. Bossen is a member of the Institute of Electrical and Electronics Engineers, Sigma Xi, Tau Beta Pi, and Eta Kappa Nu, where he received honorable mention in 1973 as Outstanding Young Electrical Engineer.

## Rodolfo A. Carballo

*Data Systems Division, East Fishkill, New York*

Mr. Carballo is an advisory engineer at the East Fishkill laboratory, where he is working on CCD and RAM memory design and testing. After joining IBM in 1965, he worked on bipolar and FET device processing, circuit design and characterization, and processing automatization. He received his B.S. in electrical engineering from Union College, Poughkeepsie, New York. Mr. Carballo is a member of the Institute of Electrical and Electronics Engineers.

## Alice Cramer

*Research Division, Yorktown Heights, New York*

Ms. Cramer received the B.S. (*cum laude*) in chemistry from Manhattan College, Bronx, New York, in 1974. Since her graduation, she has been working in the semiconductor science and technology department at the IBM Thomas J. Watson Research Center in the capacity of associate engineer. Her activity has been mainly focused in the area of state-of-the-art optical and electron-beam photolithography.

## Huntington W. Curtis

*Information Records Division, Mt. Kisco, New York*

Dr. Curtis joined IBM in 1959, becoming a senior engineer in 1960. After serving as manager of technical requirements in Federal Systems Division headquarters, he was promoted to technical advisor to the IBM Vice President for Research and Engineering, followed by assignments on the Corporate engineering staff as director of government technical liaison and as director of technical information programs. Following an assignment with the general engineering technical staff at the East Fishkill laboratory, he assumed his present position as senior systems architect in IBM Biomedical Systems. Dr. Curtis received a B.S. in chemistry and physics from the College of William and Mary, Williamsburg, Virginia, in 1942; an M.S. in physics and electrical engineering from the University of New Hampshire, Durham, in 1948; and a Ph.D. in electrical engineering from the State University of Iowa in 1950. Prior to joining IBM, he was a Professor of Electrical Engineering at Dartmouth College, Hanover, New Hampshire. Dr. Curtis is a member of the Engineering in Medicine and Biology Society, Phi Beta Kappa, Sigma Xi, and Tau Beta Pi; he is a senior member of the Institute of Electrical and Electronics Engineers.

## Martin Dreckmann

*System Products Division, Sindelfingen, Federal Republic of Germany*

Mr. Dreckmann is currently involved in the characterization of VLSI memory chips in the semiconductor plant in Sindelfingen. In 1968, he joined IBM in Sindelfingen, where he worked in the area of semiconductor processing. From 1970 to 1971 he was assigned to the Components Division in East Fishkill, New York, for processing and characterization of FET memory chips. During his assignment to the System Products Division in Burlington, Vermont, from 1975 to 1976, he was involved in VLSI product characterization, yield modeling, and yield projection. Mr. Dreckmann received an Ingenieur Grad. degree in physics from the Physikalisch Technische Lehranstalt Wedel, Wedel, Federal Republic of Germany.

## **Brian F. Fitzgerald**

*General Technology Division, Burlington, Vermont*

Mr. Fitzgerald is a senior associate engineer in the high performance array development group. His current work and interests are in the area of circuit design in FET technology, as applied to all aspects of RAM development. He joined IBM in Burlington in 1974 after receiving both his B.S. and M.S. in electrical engineering from Northeastern University, Boston, Massachusetts. Mr. Fitzgerald is a member of Eta Kappa Nu and Tau Beta Pi.

## **Donald P. Gaffney**

*General Technology Division, Burlington, Vermont*

Mr. Gaffney is an advisory engineer in the advanced circuit technology group in Burlington. He received his B.S. from the University of Scranton, Pennsylvania, in 1960 and his M.S.E.E. from the University of Vermont in 1970. Prior to joining IBM in 1964, he was with the General Electric Company, Johnson City, New York, and served as a Telecommunications Officer in the U.S. Army Signal Corps. With IBM, he has been involved in the design and testing of bipolar, FET, and magnetic film memories. As part of the 1/N design group, he was responsible for the word driver/decoder circuits and has done extensive modeling of I<sup>2</sup>L cell operation. Mr. Gaffney is a member of the Institute of Electrical and Electronics Engineers.

## **Arun K. Gaiind**

*Data Systems Division, East Fishkill, New York*

Mr. Gaiind is a development engineer at the East Fishkill laboratory, where he is currently working in the fields of epitaxy and chemical vapor deposition. After joining IBM in 1968 in East Fishkill, he worked on process development and device packaging until 1970, when he moved to his present field. He received his B.S. in 1964 from Panjab University, Chandigarh, India, and his M.S. in 1969 from the City College of New York, both in chemical engineering. At present he is working for his Ph.D. at Syracuse University. Mr. Gaiind is a member of the Electrochemical Society.

## **J. R. Gardiner**

*Data Systems Division, East Fishkill, New York*

Mr. Gardiner is a member of the advanced process development group at the East Fishkill laboratory. He joined IBM in 1964 and has been involved in chemical vapor deposition and process studies since that time. He is currently involved in advanced FET process development. Mr. Gardiner received a B.A. in chemistry from Marist College, Poughkeepsie, New York, in 1975.

## **Henry J. Geipel, Jr.**

*General Technology Division, Burlington, Vermont*

Dr. Geipel is an advisory engineer currently working in the advanced technology area at the Burlington laboratory. He joined IBM in 1974 after receiving his Ph.D. in electrical engineering-electrophysics from Rensselaer Polytechnic Institute in Troy, New York. Initially his work dealt with the development and application of ion implantation to IGFET and bipolar technologies. Since 1977, his work has involved extending IGFETs to finer geometries and process-device modeling. In 1978, he received his first IBM Invention Achievement Award. Dr. Geipel is a member of the Electrochemical Society, the Institute of Electrical and Electronics Engineers, and Sigma Xi.

## **Y. R. Gopalakrishna**

*Data Systems Division, East Fishkill, New York*

Mr. Gopalakrishna received his B.Sc. and B.E. degrees from the University of Mysore, Bangalore, India, and his M.S. in 1969 from North Dakota State University. He joined IBM in 1968 and presently is working in serial access memory design.

## **Kenneth S. Gray**

*General Technology Division, Burlington, Vermont*

Mr. Gray joined IBM in 1967 at the Product Test laboratory, Poughkeepsie, New York, where he worked on logic and memory qualifications. From 1970 to 1972, he worked in the same capacity for the Product Assurance laboratory in Burlington. Since 1972, he has been a FET memory circuit designer, and has worked on associative, RAM, and ROS memory chip designs. He received his B.S. in electrical engineering from Norwich University, Northfield, Vermont, in 1967 and his M.S. in computer science from the University of Vermont in 1978. Mr. Gray is a member of the Institute of Electrical and Electronics Engineers, the National Society of Professional Engineers, and Tau Beta Pi, and is a Registered Professional Engineer in the state of Vermont.

## **Herbert L. Greenhaus**

*Federal Systems Division, Manassas, Virginia*

Dr. Greenhaus is an advisory engineer working on set-up and implementation of lithography for an advanced VLSI program. After joining IBM in 1968 in Burlington, Vermont, he worked on chemical materials analysis, bipolar process development, and advanced FET process development technology. In 1979 he moved to the Federal Systems Division. Prior to joining IBM, Dr. Greenhaus was employed at Hewlett-Packard Corporation, Avondale, Pennsylvania, working on the development of analytical chemical instrumentation, and at General Electric Corporation, Schenectady, New York, and Cleveland, Ohio, working on solid dielectrics and gaseous electronics studies and high intensity light sources. Dr. Greenhaus received his B.S. in chemistry in 1954 from the City College of New York; his M.S. in analytical chemistry in 1957 from Syracuse University; and his Ph.D. in physical chemistry in 1965 from Rensselaer Polytechnic Institute, Troy, New York.

## **Irving T. Ho**

*National Science Council, Taipei, Republic of China*

Dr. Ho is currently Vice Chairman of the National Science Council and Director General of the newly established Hsinchu Science-based Industrial Park, after retiring from IBM in 1979. He joined IBM's Components Division in Poughkeepsie, New York, in 1963 as an advisory engineer and was later promoted to development manager and senior engineer. While with IBM, he received twelve IBM Invention Achievement Awards for work in semiconductor devices, circuits, and subsystems. He received his M.S. and Ph.D. in electrical engineering in 1957 and 1961 from Stanford University. Dr. Ho is a member of Sigma Xi.

### **M. Y. (Ben) Hsiao**

*Data Systems Division, Poughkeepsie, New York*

Dr. Hsiao is a senior technical staff member and manager of the laboratory engineering analysis department. His current professional interests include research and development in computer reliability, availability, serviceability, error-correcting codes, error detection, failure-isolation techniques, and system engineering analysis. He joined IBM in Poughkeepsie in the advanced reliability technology department in 1960. From 1965 to 1967 he was on educational leave to the University of Florida, after which he returned to IBM as advisory engineer in the reliability and diagnostic engineering department. In 1969, he was promoted to senior engineer and manager of the reliability technology department. He assumed his present position in 1979. Dr. Hsiao received his B.S. in electrical engineering in 1956 from Taiwan University, Taipei, his M.S. in mathematics in 1960 from the University of Illinois, and his Ph.D. in electrical engineering in 1967 from the University of Florida. He has seven IBM Invention Achievement Awards and two IBM Outstanding Innovation Awards in the areas of error-correction codes, error detection, and failure-isolation techniques. Dr. Hsiao is a Fellow of the Institute of Electrical and Electronics Engineers.

### **Lucian A. Kasprzak**

*Data Systems Division, East Fishkill, New York*

Dr. Kasprzak is a development engineer and manager of memory device physics and reliability. He joined IBM in 1965 and has worked in the fields of failure analysis, scanning electron microscopy, the electron microprobe, laser scanning, MOS development and MOSFET, and bipolar LSI reliability. He received a B.S. in physics from Stevens Institute of Technology, Hoboken, New Jersey, in 1965 and an M.S. in physics from Syracuse University, New York, in 1970. He did further graduate work while on an IBM Resident Fellowship and received a Ph.D. from Stevens Institute of Technology in 1972. Dr. Kasprzak is a member of the American Association of Physics Teachers, the American Physical Society, the American Vacuum Society, the Electrochemical Society, and the Institute of Electrical and Electronics Engineers.

### **Richard A. Kenyon**

*General Technology Division, Burlington, Vermont*

Mr. Kenyon is a staff engineer in advanced logic and array technology currently engaged in chip design and test strategy on microprocessor products at the Burlington laboratory. His earlier assignments include memory circuit design and architecture for MNOS PROMs and circuit design for serial stored charge memories. He joined IBM in Burlington in 1970, having been previously employed by Signetics Corporation as a design engineer for bipolar logic and special circuits. Mr. Kenyon holds an M.S. in electrical engineering from San Jose State University (1969) and a B.Sc. in engineering from London University, England (1962).

### **Richard A. Larsen**

*General Technology Division, Burlington, Vermont*

Dr. Larsen joined IBM in Burlington in 1974, working in the area of SAMOS process engineering, with technical interest in ion implantation and the characterization of dielectric charge and silicon dopants. He is currently a development engineer and manager of the SAMOS hot process development. He received a B.S. in chemistry from the University of Virginia, Charlottesville, in 1969. Dr. Larsen received an M.S. in 1972 and a Ph.D. in 1974, both in chemistry, from Harvard University.

### **T. C. Lo**

*Data Systems Division, East Fishkill, New York*

Mr. Lo received the B.S.E.E. degree from the National Taiwan University, Taipei, in 1965, and the M.S.E.E. degree from the Carnegie-Mellon University, Pittsburgh, Pennsylvania, in 1968. During 1966 he was employed by Fairchild Semiconductor, Hong Kong, as an applications engineer working on audio and radio-frequency circuits. In 1969 he worked for Vikoa Inc., Hoboken, New Jersey, on high-frequency transistor characterization and microwave-circuit design for CATV Systems. From 1971 to 1976, he worked for American Microsystems, Inc., Santa Clara, California, on the design of integrated circuits; he was later appointed manager of n-channel engineering and was responsible for the design of various 4K-bit RAMs and the early development of VMOS technology. He joined Fairchild in 1976 as manager of dynamic RAMs. Upon completion of the 16K-bit RAM project, he joined IBM at the Data Systems Division in East Fishkill, New York, in 1977, as an advisory engineer working on 64K-bit RAM design and was subsequently appointed manager of high-density RAMs. Mr. Lo is a member of the Institute of Electrical and Electronics Engineers.

### **Andrew N. McLaren**

*General Technology Division, Burlington, Vermont*

Mr. McLaren is an advisory engineer in a characterization and design group with responsibilities for memory development. He applies probabilistic and statistical techniques to yield prediction and design optimization. He joined IBM in 1967 and has since worked on a variety of statistical problems, the majority in the area of memory development. He received a B.Sc. degree in physics in 1963 from the Bristol College of Science, Bristol, England, and an M.S. degree in organizational behavior in 1967 from Cornell University, Ithaca, New York.

### **Pierre B. Mollier**

*System Products Division, Corbeil-Essonnes, France*

Mr. Mollier is manager of the device engineering department in the Essonnes component development laboratory. He joined IBM in 1962 as a circuit design engineer in the IBM France Military Division, Paris, where he developed special circuits and ferrite core arrays for memories used in severe military environments. He moved to semiconductor component development in 1970. From then until 1976 he managed the development of several MSI and LSI memory and logic chips used in the IBM System/370 and an IBM 4300 computer system. Mr. Mollier transferred to the General Technology Division laboratory in Burlington, Vermont, in 1976 for a two-year assignment as an advisory engineer to work on the 1/N advance technology program. He went back to the Essonnes laboratory in 1978 to participate in the design and development of VLSI read-only and random access memory chips. Mr. Mollier received graduate degrees in mathematics, mechanics, electricity, and electronics at the Faculté des Sciences, La Sorbonne, Paris, from 1956 to 1959. Mr. Mollier graduated from the Institut Supérieur d'Electronique de Paris in 1959.

### **Douglas W. Ormond**

*Data Systems Division, East Fishkill, New York*

Mr. Ormond joined IBM in 1970 in the applied research department at the Thomas J. Watson Research Center, Yorktown Heights, New York, working in the area of silicon technology. In

1978 he transferred to the East Fishkill facility to pursue memory product development of high density silicon chips. He is presently working on metallurgy contacts and interconnecting device lines for micron and submicron technology. In 1970 he received his B.S. in chemistry from the Polytechnic Institute of Brooklyn; and in 1973 he received his M.S. in metallurgy from New York University. Mr. Ormond is a member of the Electrochemical Society.

#### **Mun S. (Peter) Pak**

*Data Systems Division, East Fishkill, New York*

Mr. Pak has worked as a development engineer at the General Electric Research and Development Center in Schenectady, New York, and at the General Telephone and Electronics Research and Development Center, Bayside, New York. He joined IBM in 1968 and worked on various process development and diagnostics; he presently holds an advisory engineer position. He has a B.A. in chemistry from Queens College, New York, and an M.A. in chemistry from Union College, Schenectady, New York. Mr. Pak is a member of the Electrochemical Society.

#### **V. Leo Rideout**

*Research Division, Yorktown Heights, New York*

Dr. Rideout received the B.S.E.E. degree with honors in 1963 from the University of Wisconsin, Madison, the M.S.E.E. degree in 1964 from Stanford University, California, and the Ph.D. degree in materials science in 1970 from the University of Southern California, Los Angeles. From 1963 to 1965 he was a member of the technical staff of Bell Telephone Laboratories, where he worked on high-frequency germanium transistors and metal-semiconductor Schottky barriers on potassium tantalate. In 1966 he spent a year as a Research Assistant in the Department of Materials Science at the Technological University of Eindhoven, The Netherlands, studying acoustoelectric effects in cadmium sulphide. In 1970, he joined IBM Research in the device research group, where he worked on fabrication and contact technology for multi-heterojunction "superlattice" structures using gallium-arsenide-phosphide and gallium-aluminum-arsenide. From 1972 to 1978, he was a member of the semiconductor device and circuit group, working on very high density polysilicon-gate MOS-FET technology. During 1978 he was a member of the technical planning staff of the Director of Research. Presently, he is manager of the exploratory process studies group in the semiconductor technology department at the Thomas J. Watson Research Center. Dr. Rideout is a member of the Electrochemical Society, Eta Kappa Nu, Phi Kappa Phi, Sigma Xi, and Tau Beta Pi.

#### **Jacob Riseman**

*Data Systems Division, East Fishkill, New York*

Dr. Riseman is an IBM Fellow and manager of advanced materials and technology at East Fishkill, where he works on one-micron bipolars, four-level metal, and materials studies. He joined IBM in 1958 in Poughkeepsie, New York. In 1968 he was named an IBM Fellow. From 1975 to 1976 he served on the Corporate Technical Committee. In 1947 he received his Ph.D. in chemical engineering from Cornell University, Ithaca, New York. Dr. Riseman received his twelfth IBM Invention Achievement Plateau Award in 1979. He has received two IBM Outstanding Invention Awards, one in 1963 for protective coating for semiconductors and one in 1969 for device glassing.

#### **Roy E. Scheuerlein**

*Data Systems Division, East Fishkill, New York*

Mr. Scheuerlein received a B.S. and M.S. in physics in the Unified Honors program in 1969 from the Polytechnic Institute of Brooklyn. Since he joined IBM at East Fishkill in 1969, his technical interest has been in FET logic and memory circuit design. Currently Mr. Scheuerlein is an advisory engineer engaged in 64K-bit RAM circuit design at East Fishkill.

#### **James E. Selleck**

*General Technology Division, Burlington, Vermont*

Mr. Selleck joined the circuit technology area at IBM in Poughkeepsie, New York, in 1964. He transferred to Burlington in 1967 to work on bipolar product engineering. Since 1970 he has worked in the advanced technology area, where he is now an advisory engineer in programmable memories. Mr. Selleck received his B.S. degree in electrical engineering from the University of Vermont, Burlington, in 1963 and his M.S. degree in electrical engineering from the University of Illinois, Urbana, in 1967. He was a NASA Trainee and an IBM Resident at the University of Vermont from 1968 to 1971. Mr. Selleck is a senior member of the Institute of Electrical and Electronics Engineers; a member of the American Association for the Advancement of Science, Tau Beta Pi, and the Vermont Society of Engineers; an associate member of Sigma Xi; and a Registered Professional Engineer.

#### **Richard B. Shasteen**

*General Technology Division, Burlington, Vermont*

Mr. Shasteen is a staff engineer at Burlington. He has current engineering responsibilities for advanced FET hot processing, including oxidation, diffusion, and wafer cleans. He joined IBM in 1968 at the Burlington facility and was initially responsible for electron microscopic materials studies. His work on electron microscopic, optical and x-ray studies of crystalline defects induced during processing of bipolar and FET devices earned him an IBM Outstanding Contribution Award in 1974. Other significant assignments within IBM include development of advanced FET processes including ROX, implanted junctions, and thin gate insulator structures. Mr. Shasteen attended the University of Cincinnati, Ohio, and Youngstown State University, Ohio. Before joining IBM, he was employed as a metallurgist at Youngstown Steel Company and then as an electron microscopist at United Technologies in East Hartford, Connecticut.

#### **C. H. Stapper**

*General Technology Division, Burlington, Vermont*

Dr. Stapper is a senior engineer responsible for yield planning at the Burlington development laboratory. He received his B.S. and M.S. in electrical engineering from the Massachusetts Institute of Technology in 1959 and 1960. He joined the IBM development laboratory in Poughkeepsie, New York, in 1960, where he worked on magnetic recording and the memory applications of tunnel diodes, magnetic thin films, electron beams, and lasers. From 1965 to 1967 he studied at the University of Minnesota on an IBM fellowship. Upon receiving his Ph.D. in solid state physics in 1967, he joined the IBM development laboratory in Burlington. His work there included magnetic thin film array development, magnetic bubble testing and device theory, bipolar and field effect transistor device theory, large-scale integration yield modeling, and predicting semiconductor memory reliability. Dr. Stapper is a member of the Institute of Electrical and Electronics Engineers and Sigma Xi.

## Robert Tamlyn

*Data Systems Division, East Fishkill, New York*

After receiving a B.S. and an M.S. in electrical engineering from Rensselaer Polytechnic Institute, Troy, New York, Mr. Tamlyn joined IBM in 1973 at Burlington, Vermont. From 1973 to 1978, he worked as a circuit designer on various memory chips eventually culminating with the 32K-bit SAMOS random access memory chip. In 1978, he transferred to the Data Systems Division in East Fishkill, where he continues to work as a memory chip designer. Mr. Tamlyn is a member of Tau Beta Pi.

## Endre P. Thoma

*General Technology Division, Burlington, Vermont*

Mr. Thoma is a staff engineer working in high density array development. His current work is circuit design in FET technology. From 1970 to 1974, he was involved in circuit design of bipolar technology. He joined IBM Burlington in 1970, after receiving his B.S. in electrical engineering from the University of Vermont. Mr. Thoma is a member of Tau Beta Pi.

## Warren K. Tice

*General Technology Division, Burlington, Vermont*

Mr. Tice is a member of the materials analysis department in the Burlington laboratory. He is an advisory engineer working on bipolar memory device behavior, process yield enhancement, and fundamental studies of crystal imperfections in silicon. He received the IBM Outstanding Contribution Award in 1974 for developing low defect impurity diffusion processes used in semiconductor device processing. Mr. Tice also received the IBM Outstanding Innovation Award in 1978 for studies of the cause of defect leakage currents in a dynamic FET memory process and ion implantation gettering. He received a B.S. from the University of Connecticut in 1960. Before joining IBM in 1970, he was with United Technologies Research Laboratories, where he was engaged in the development of alloys used for high temperature aircraft turbines. Mr. Tice is a member of the Electrochemical Society.

## Ronald R. Troutman

*General Technology Division, Burlington, Vermont*

Dr. Troutman received the B.S. degree in electrical engineering from the Massachusetts Institute of Technology in 1962 and the M.S. and Ph.D. degrees in electrical engineering from New York University in 1963 and 1966. From 1966 to 1968, he served as Scientific Officer in the Electronics Branch at the Office of Naval Research. In 1968 he joined IBM in Burlington, where he has worked on the design and development of various magnetic and semiconductor memory devices, including the SAMOS dynamic memory technology. He has made numerous contributions to random access memory design and to an understanding of short channel effects and of subthreshold and hot electron behavior in silicon IGFETs. His current interests are electrically alterable memories and device limitations in advanced integrated circuit technologies. Dr. Troutman is a senior member of the Institute of Electrical and Electronics Engineers and a member of Eta Kappa Nu and Sigma Xi.

## Albert J. Tzou

*Data Systems Division, East Fishkill, New York*

Since joining IBM in 1968 in Poughkeepsie, New York, Mr. Tzou has worked on FET process development, MST and enhanced bipolar logic design, 8K-bit ROS by Schottky barrier array, and  $256 \times 9$  bipolar static RAM. At present he is manager of 256K-bit CCD chip design. He received his B.S. in physics from the University of Washington in 1967 and his M.S. in physics from Syracuse University, and did further graduate work in physics at New York University from 1973 to 1975. Mr. Tzou is a member of the American Physical Society.

## Roger Verkuil

*Data Systems Division, East Fishkill, New York*

Mr. Verkuil has been involved with the development of semiconductor characterization and diagnostic tools during the last ten years in East Fishkill. He received an associate level diploma (honor graduate) from RCA Institute, New York, in 1963 and a B.S. in electrical engineering (*summa cum laude*) from the Polytechnic Institute of New York in 1968. Mr. Verkuil received an IBM Outstanding Contribution Award for work in FET device phenomena in 1974. Mr. Verkuil is a member of the Electrochemical Society.

## John J. Walker

*Data Systems Division, East Fishkill, New York*

Mr. Walker is currently enrolled as a part-time student at Union College in Poughkeepsie, New York, working towards a B.S. in computer science with a hardware major. He joined the IBM Thomas J. Watson Research Center, Yorktown Heights, New York, in 1967. He took a leave of absence in 1968 to enter military service, serving four years in the U.S. Air Force as an avionics electronics navigational equipment repairman. He returned to the Research Center in 1972, joining the semiconductor device and circuit design group. He transferred to East Fishkill in 1978 into the high density RAM department, where he is currently working as a senior lab specialist. His current work includes circuit design and the simulation as well as layout and testing associated with a chip design.

## Frank W. Wiedman

*General Technology Division, Burlington, Vermont*

Mr. Wiedman joined IBM at the Poughkeepsie, New York, development laboratory in 1964. He transferred to the Burlington laboratory in 1967, where he held the positions of manager of the circuit technology group responsible for the  $1/N$  memory and other projects and manager of the advanced programmable array technology group. He is currently technical staff assistant to the SAMOS product manager. Mr. Wiedman received a B.S. in electrical engineering from the Polytechnic Institute of New York in 1964.