Authors

Irving Ames

Research Division, Yorktown Heights, New York

Dr. Ames presently has managerial responsibility for two materials-oriented groups with the Josephson program at the Thomas J. Watson Research Center. From 1970 to 1978, he was manager of the materials group and circuit fabrication group within that program. He joined IBM in 1955 after receiving his Ph.D. in physics from Cornell University, Ithaca, New York, and prior to that, his B.A. in physics from Syracuse University, New York. He has received three IBM Outstanding Invention Awards in the area of vacuum, surface, and thin film phenomena. Dr. Ames is a member of the American Physical Society, the American Vacuum Society, and the Institute of Electrical and Electronics Engineers.

Wilhelm Anacker

Research Division, Yorktown Heights, New York

Dr. Anacker received his Ph.D. in electrical engineering in 1963 from the Technische Hochschule, Munich, Germany, where he was responsible for development and operation of one of the first electronic computers, PERM, in Germany. He joined IBM in 1963 at the Thomas J. Watson Research Center and has worked on high speed thin magnetic film memories and large capacity bulk stores and has conducted a study of performance evaluation of memory hierarchies. He became manager of a research group in applied physics in 1967 and initiated a feasibility study of superconducting switching devices for digital applications. He assumed his present position as manager of the exploratory cryogenic technology department in 1975. He is responsible for the Josephson technology project, which has been expanded and now includes activities at the Research laboratories in Yorktown and Zurich, Switzerland and at the DSD laboratory in East Fishkill, New York. Dr. Anacker has received the NTG Award in 1964 of the Nachrichten Technische Gesellschaft (Germany). He received IBM Outstanding Contribution and Outstanding Invention Awards related to memory hierarchy studies and Josephson technology memories and holds several patents. Dr. Anacker is a senior member of the Institute of Electrical and Electronics Engineers and a member of Nachrichten Technische Gesellschaft.

John M. Baker

Research Division, Yorktown Heights, New York

Dr. Baker is a Research staff member in the applied research department at the Thomas J. Watson Research Center, where he has been employed since 1972. His primary interest is in surface studies, which he has applied to investigations of the oxides used for Josephson devices and to the study of mechanisms of oxidation. He received an A.B. degree from Harvard University in 1964 and a Ph.D. in applied physics in 1970 from Cornell University, Ithaca, New York. Dr. Baker is a member of the American Physical Society and the American Vacuum Society.

Suryadevar Basavaiah

Research Division, Yorktown Heights, New York

Dr. Basavaiah joined the IBM Thomas J. Watson Research Center, Yorktown Heights, New York, in 1968. He worked briefly in the area of switching and conduction phenomena in $Nb/Nb_2O_5/Bi$ junctions. For the last ten years, he has been working in the area of Josephson technology, where his primary interests are tunneling phenomena, device and process characterization, and reliability. In 1976 he received an Outstanding Contribution Award from IBM for the development of the Josephson technology process. He received a B.E. from Madras University, an M.E. from the Indian Institute of Science, Bangalore, an M.S. from Princeton University and a Ph.D. from the University of Pennsylvania, all in electrical engineering. He taught at Drexel University in Philadelphia from 1963 to 1966. More recently, from 1978 to 1979, he was a visiting Associate Professor there on sabbatical from IBM. Dr. Basavaiah is a senior member of the Institute of Electrical and Electronics Engineers and a member of the American Physical Society.

Ronald F. Broom

Research Division, Zurich, Switzerland

Dr. Broom received the B.Sc. degree from the University of St. Andrews, Scotland, in 1951 and the Ph.D. degree from the University of Berne, Switzerland, in 1968. From 1955 until 1966 he was employed at the Services Electronics Research Laboratory, Baldock, England, where he studied transport phenomena in compound semiconductors, cryogenic switching devices, and opto-electronic systems. For three years, until 1969, he was a staff member of the Applied Physics Department of the University of Berne, engaged in research on diode lasers. In September 1969 he joined the device technology group at the IBM Zurich Research laboratory, where he studied Schottky diodes and other design problems associated with the Schottky barrier FET. Since 1971 he has worked on the technology of Josephson tunnel junctions for use in logic and memory circuits. Dr. Broom is a fellow of the Institute of Physics, London.

Paul R. Brosious

Research Division, Yorktown Heights, New York

Dr. Brosious joined IBM as a post-doctoral fellow of the physical sciences department at the Thomas J. Watson Research Center in 1974. There, he used electron paramagnetic resonance, optical spectroscopy, and photoconduction to study electron and ion radiation effects in solids. He became a research staff member in the applied research department in 1976, where he studied low energy particle interactions during formation of the Josephson tunnel barrier oxide. In 1978 he became manager of a Josephson technology group. Currently his research interests include Josephson device fabrication process development, low energy plasmas, high GHz microwave generation and detection, electron paramagnetic resonance, and defects in semiconductors. He received his M.S. degree in physics from Bucknell University, Lewisburg, Pennsylvania, in 1966 and his Ph.D. in physics from New York State University, Albany, in 1972. Dr. Brosious is a member of the American Physical Society, the American Vacuum Society, Kappa Delta Pi, Sigma Pi Sigma, and Sigma Xi.

Alan V. Brown

Research Division, Yorktown Heights, New York

Dr. Brown was awarded a B.A. in engineering from Cambridge University, England, in 1952 and a Ph.D. in electronics from Stanford University, California, in 1956. From 1957 to 1959 Dr. Brown was senior development engineer with Ferranti Ltd., England, working on the design of pulsed klystrons. In 1959 he joined the staff of the IBM Thomas J. Watson Research Center to form a group studying the application of electron optics to various problems associated with computer technology. From 1964 to 1972, he worked in the areas of interconnection technology for high speed logic circuits and then in the area of display devices. From 1973 to 1975 he was on the staff of the IBM Chief Scientist at Corporate Headquarters in Armonk, New York. In 1975 he returned to the Research Center to set up a group studying interconnection technology in the exploratory cryogenic technology area. Dr. Brown is a senior member of the Institute of Electrical and Electronics Engineers.

Sadeg M. Faris

Research Division, Yorktown Heights, New York

Dr. Faris received his B.S., M.S., and Ph.D. degrees in electrical engineering in 1969, 1971, and 1975, from the University of California, Berkeley. In 1975 he joined the memory group of the cryogenic department at the IBM Thomas J. Watson Research Center. He has since been designing high performance Josephson devices, memory and logic circuits. Among his contributions to the Josephson program are the invention of the loop decoder, short pulse generators, the sense bus, the ultrahigh resolution sampling technique, and the polarity switch.

Tushar Gheewala

Research Division, Yorktown Heights, New York

Dr. Gheewala completed his undergraduate work at the Indian Institute of Technology, Bombay, India. He received his Ph.D. in electrical engineering in 1976 from Stanford University, California. Dr. Gheewala joined IBM at the Thomas J. Watson Research Center in 1976. He is at present manager of the Josephson logic group responsible for development of advanced logic circuits. He received an IBM Outstanding Innovation Award for the invention of ultrahigh-speed logic circuits. Dr. Gheewala is a member of the Institute of Electrical and Electronics Engineers and Sigma Xi.

James H. Greiner

Research Division, Yorktown Heights, New York

Mr. Greiner has been associated with Josephson technology since 1968. He has worked on the tunnel barrier formation process and on the fabrication process for logic and memory circuits. In 1973, he received an IBM Outstanding Invention Award for the tunnel barrier work, and in 1976 an IBM Outstanding Contribution Award for the fabrication process work. Currently, Mr. Greiner is manager of the circuit fabrication group. After joining IBM at Endicott, New York in 1956, he came to the Thomas J. Watson Research Center in 1961 and investigated magnetic and optical properties of thin films prior to the Josephson work. Mr. Greiner received a B.S. in physics from Le Moyne College, Syracuse, New York, in 1954, and an M.S. in physics from the University of Detroit, Michigan, in 1956. He is a member of the American Vacuum Society.

P. Guéret

IBM Switzerland, Zurich

Dr. Guéret received his B.E. degree in electrical and mechanical engineering from the University of Louvain, Belgium, in 1961. After spending one semester in the Microwave Institute of the Technical University of Munich, he went to Stanford University, California, where he obtained an M.S. and a Ph.D. in electrical engineering in 1964 and 1967. He subsequently joined the Lockheed Palo Alto Research Laboratory. In 1968, he joined IBM at the Zurich Research laboratory in Switzerland. His early interests were in the field of wave propagation and instabilities in semiconductors, including the Gunn effect. In 1972 he turned to superconductivity to work on digital applications of Josephson junctions. Dr. Guéret has recently joined the Data Processing Division of IBM Switzerland.

Walter H. Henkels

Research Division, Yorktown Heights, New York

In 1966 Dr. Henkels received a B.S. in engineering physics from Lehigh University, Bethlehem, Pennsylvania, and was elected to Phi Beta Kappa and Tau Beta Pi. He pursued graduate work in applied physics at Cornell University, Ithaca, New York, from 1966 to 1971, subsequently receiving a Ph.D. in 1974. Since 1971 he has been located at the IBM Thomas J. Watson Research Center, where he has been involved with a group investigating possible applications of Josephson tunnel junctions to digital circuits. These applications include his current interest in high speed NDRO memories. Dr. Henkels is a member of the American Association for the Advancement of Science, the American Physical Society, and the Institute of Electrical and Electronics Engineers.

Dennis J. Herrell

Research Division, Yorktown Heights, New York

Dr. Herrell obtained a B.Sc. in physics from Imperial College in 1964 and joined IBM United Kingdom Laboratories at Hursley. There he was involved in the design and development of memory and logic for the 360 computer series. Upon receipt of an IBM advanced education award he attended Cambridge University from 1966 to 1969. He received a Ph.D. at the Cavendish for his work on the electrical and structural properties of amorphous binary alloys. After a brief period at Hursley evaluating his proposed Lorentz microscopy technique for magnetic head field measurements, he transferred to the Thomas J. Watson Research Center. There, Dr. Herrell became principally involved in the Josephson effect following an initial investigation of amorphous film switching. He has contributed a number of significant milestones in the Josephson project including the design and operation of a one-bit adder circuit for which Dr. Herrell received an IBM Outstanding Contribution Award. He also designed and operated a Josephson four-bit multiplier circuit. Dr. Herrell is presently the manager of the package, power, and test group having the responsibilities of the electrical evaluation of the Josephson package, logic circuit power supplies, and test engineering both for Josephson circuits and package parts. Dr. Herrell is a member of the American Physical Society, the Institute of Electrical and Electronics Engineers, and the Institute of Physics.

H.-C. Ward Huang

Research Division, Yorktown Heights, New York

Dr. Huang joined IBM in 1974 and is presently at the Thomas J. Watson Research Center, where he is involved in the study of the materials and process aspects of Josephson junctions. He received his B.S. from the National Normal University in Taipei, Taiwan, Republic of China, in 1967, his M.S. from the University of Massachusetts in 1970, both in physics, and his Ph.D. in materials science from Cornell University in 1975. Dr. Huang is a member of the American Vacuum Society.

Rudolf Jaggi

Research Division, Zurich, Switzerland

Dr. Jaggi obtained his Ph.D. at the Swiss Federal Institute of Technology, Zurich, in 1959. In the same year, he joined IBM at the Zurich Research laboratory and has worked in the areas of ferromagnetic films, semimetals, semiconductors, and superconductors. Dr. Jaggi is a member of the Swiss Physical Society and the German Physical Society.

Harris C. Jones

Research Division, Yorktown Heights, New York

Dr. Jones obtained a B.A. in physics from Dartmouth College, Hanover, New Hampshire, in 1966, and his M.S. in physics from the Missouri School of Mines and Metallurgy (now the University of Missouri at Rolla) in 1968. He received his Ph.D. from the University of Geneva, Switzerland, in 1975 for his work on the physical properties of superconducting alloys and alloy thin films. Before joining IBM in 1977, Dr. Jones was a research assistant at Indiana University, studying the magnetic and electrical properties of spin glasses in high magnetic fields. Dr. Jones is presently a research staff member working on advanced Josephson logic devices and circuits in the exploratory cryogenic technology group at the Thomas J. Watson Research Center. Dr. Jones is a member of the Institute of Electrical and Electronics Engineers.

Charles J. Kircher

Research Division, Yorktown Heights, New York

Dr. Kircher is a member of the Thomas J. Watson Research Center. He received a B.S. in electrical engineering from Marquette University, Milwaukee, Wisconsin, in 1962, and a Ph.D. in electrical engineering from Northwestern University, Evanston, Illinois, in 1968. After joining IBM Research in 1967, he worked until 1973 on semiconductor device technology, principally on metal-semiconductor contacts and leakage currents in shallow p-n junctions. Since 1973 Dr. Kircher has been the manager of a group investigating materials and processes for Josephson tunneling devices. In 1973 he received an IBM Outstanding Contribution Award for his work on metal-semiconductor contacts. Dr. Kircher is a member of the American Physical Society.

Stephen P. Klepner

Research Division, Yorktown Heights, New York

Dr. Klepner received his B.S., M.S. and Ph.D. in physics from New York University in 1962, 1966, and 1970. He joined IBM in 1969. From then until 1976, he worked on problems involving multilevel metallurgy, bipolar transistor yield and field effect transistor processing. In 1976, he joined the circuit fabrication portion of the Josephson program at the Thomas J. Watson Research Center.

Willi Kotyczka

Stäfa Control System AG, Stäfa-ZH, Switzerland

After working as an exchange student at the Western Electric Research Center, Princeton, New Jersey, in 1966, Dr. Kotyczka received the Diploma in 1967 in electrical engineering and the Ph.D. degree in 1971, both from the Swiss Federal Institute of Technology, Zurich. From 1972 to 1974, he worked in the Research Department at Hughes Aircraft Company, where he was engaged in the design and development of CCD memories. In 1975 he joined the IBM Zurich Research laboratory, where he was involved in Josephson memory circuits. Since early 1978 he has been with the Stäfa Control System Company as assistant to the President.

Syamal Lahiri

Research Division, Yorktown Heights, New York

Dr. Lahiri is a member of the applied research department at the Thomas J. Watson Research Center. He joined IBM as a research staff member in 1968 and has worked primarily in areas related to the materials and process development for Josephson tunneling integrated circuits. In recent years his work has been concentrated on the development of miniaturized packages for the Josephson technology program. Dr. Lahiri received an IBM Outstanding Invention Award in 1976 for work on thin film resistors and contacts for circuitry. He received his Ph.D. in materials science from Northwestern University, Evanston, Illinois, in 1969. Dr. Lahiri is a member of American Physical Society, the American Society for Metals, the American Vacuum Society, the Electrochemical Society, and Alpha Sigma Mu.

R. B. Laibowitz

Research Division, Yorktown Heights, New York

Dr. Laibowitz is currently manager of the superconductivity group, which is studying superconducting materials, Josephson-related devices and properties of ultra-small structures. He joined the Research Division in 1960 at the Mohansic laboratory and has worked on mechanical properties of alkali halides and tunneling in semiconductors. From 1974 to 1976 he was on assignment at the IBM Research laboratory in Zurich, Switzerland. He received his B.A. in 1951 from Columbia College, his B.S.E.E. in 1960 and M.S.E.E. in 1963 from Columbia University, and his Ph.D. in applied physics in 1967 from Cornell University. Dr. Laibowitz is a member of the American Physical Society and the American Vacuum Society.

Juri Matisoo

Research Division, Yorktown Heights, New York

Dr. Matisoo is manager of engineering for exploratory cryogenic technology at the Thomas J. Watson Research Center, where he is responsible for device, circuit, and memory development for the Josephson technology program. He received his B.S. and M.S. in electrical engineering at the Massachusetts Institute of Technology in 1959 and 1960. While an undergraduate student, he worked at various IBM locations, including the Research laboratories, then in Poughkeepsie, New York and Zurich, Switzerland, in the areas of integrated circuit development and magnetic film memories. After graduation, he spent a year at the Illinois Institute of Technology, again in integrated circuit development

activity. In 1961 he returned to school, as the Control Data Corporation Fellow at the University of Minnesota, receiving a Ph.D. in electrical engineering in 1964. After returning to IBM Research full-time, he became interested in the Josephson effect. He received the IEEE's 1978 Jack A. Morton Award for outstanding contributions in the field of solid-state devices for "pioneering the Josephson computer technology." Dr. Matisoo is a senior member of the Institute of Electrical and Electronics Engineers and a member of the American Physical Society, Eta Kappa Nu, and Sigma Xi.

J. W. Matthews

Deceased

Dr. Matthews was manager of the research group on materials structure and electronic properties at the Thomas J. Watson Research Center, Yorktown Heights, New York, until his death in May of 1977. He was educated at the University of Witwatersrand in South Africa, where he obtained the B.S. and Ph.D. degrees in physics. He became a member of the faculty of the Physics Department there in 1957 and subsequently held the positions of Junior Lecturer, Lecturer, Senior Lecturer, and Reader. He came to the United States in the mid-1960s and, after teaching physics at the University of Virginia, joined IBM Research in 1969. From July 1973 to June 1974 he was an Overseas Fellow at Churchill College, Cambridge, England. Dr. Matthews specialized in the structure and defect properties of materials.

Theodor O. Mohr

Research Division, Zurich, Switzerland

Dr. Mohr received his diploma in physics in 1959 and his Dr. rer. nat. in 1952, both at the M. Luther University, Halle, Germany. He was Research Assistant at the physics department of the University Halle from 1950 to 1954. He worked as a physicist in the Research and Development Laboratories of the Werk fur Bauelemente der Nachrichtentechnik Teltow-Berlin, Germany, from 1954 to 1958 and in the Intermetall Company, Freiburg-Breisgau, Germany, from 1958 to 1961. He joined IBM in 1961 as a physicist in the Zurich Research laboratory, where he was manager of the device technology group until the end of 1978 and is now assigned to special studies. His field of interest is fast active semiconductor devices, Josephson tunneling devices, and integrated digital circuitry. Dr. Mohr is a member of the German Physical Society.

Andreas Moser

Research Division, Zurich, Switzerland

In 1959, Mr. Moser joined the IBM Zurich Research laboratory, where he first worked in the field of thin magnetic-film memories. In 1966, he worked on applications of the metal-semiconductor field-effect transistor (MESFET) started in the Zurich laboratory with special emphasis on the device characterization. Later, he was engaged in the development of high packing-density MESFET memory cells and in high-speed GaAs, 1-μm gate length, and normally off-type Schottky-barrier FET logic technology. In 1970, he started work on the characterization of nonvolatile memory effects in GaAs Schottky diodes. Since 1974 he has been involved in Josephson efforts in the Zurich laboratory, where he is responsible for the memory logic circuitry and for the chip design.

Masanori Murakami

Research Division, Yorktown Heights, New York

Dr. Murakami joined the IBM Thomas J. Watson Research Center in 1975. His current interests include characterization and strain-relaxation studies of Pb-alloy thin films. He received his B.S. in 1966, his M.S. in 1968, and his Ph.D. in 1971, all in materials science from Kyoto University, Japan. He was a post-doctoral fellow and then a research associate at the University of California in Los Angeles from 1971 to 1975. Dr. Murakami is a member of the American Vacuum Society, the Metallurgical Society of the American Institute of Metals and Engineering, and the Metallurgical Society of the Japanese Institute of Metals.

A. Oosenbrug

Research Division, Zurich, Switzerland

Mr. Oosenbrug finished his studies in 1974 at the Delft University of Technology, in the department of electrical engineering with the degree of Engineer. Subsequently, he joined the LEOK, Dutch Defense Research Laboratory, working on microwave integrated circuits. Since 1975 he has been with the IBM Zurich Research laboratory in Switzerland. He is now working on the technology of Josephson devices.

Frank F. Tsui

Research Division, Yorktown Heights, New York

Dr. Tsui is associated with the advanced technology group at the development laboratories of IBM Germany in Boeblingen. Since 1975, he has been on assignment to the exploratory cryogenic technology group in the applied research department at the Thomas J. Watson Research Center, where he has been working on the systems aspects of Josephson technology. He received his B.S. in physics from the Yenching University of Peiping, China, in 1948, and his Ph.D. in electrical engineering from the University of Liverpool, England, in 1954. From 1955 to 1965, he was an Assistant Professor at the Technical University of Munich, Germany, where he also designed and built the magnetic-core memory for the computer PERM there. He joined the Boeblingen laboratories of IBM Germany in 1965 and has worked on CPU development for low-end systems, teleprocessing hardware, semiconductor memory design, storage technologies for advanced systems, and advanced computer system concepts. Dr. Tsui is a member of the German Association of Electrical Engineers (VDE), the German Communications Engineering Association (NTG), and the Institute of Electrical and Electronics Engineers.

Emmanuel A. Valsamakis

Research Division, Yorktown Heights, New York

Dr. Valsamakis is a research staff member with a cryogenic technology group investigating memory applications with Josephson tunneling junctions. He joined the IBM Components Division, East Fishkill, New York, in 1967 and was engaged in bipolar and FET device design and circuit analysis for memory and logic applications. During 1975 he was on a sabbatical from East Fishkill to the Thomas J. Watson Research Center under the creative development program modeling short channel FET devices. Prior to joining IBM he was a research scientist at Grumman Aircraft conducting experimental investigations of plasmas from pulsed plasma sources. He taught at various times at Rensselaer Polytechnic Institute, Troy, New York; Cooper Union, New

York, New York; and the New York Institute of Technology, New York. He received his B.S.E.E. from Robert College, Istanbul, Turkey; and his M.S. and Ph.D. in electrical engineering from Rensselaer Polytechnic Institute in 1958 and 1963. Dr. Valsamakis is a member of the American Physical Society, the Institute of Electrical and Electronics Engineers, Eta Kappa Nu, Sigma Xi, and Tau Beta Pi.

Wilhelm Walter

Research Division, Zurich, Switzerland

Mr. Walter completed his apprenticeship as electromechanic in Zurich in 1949. He then worked for a number of companies as technical assistant, where he was engaged in such varied topics as high-frequency polishing machines, pneumatic valves, and high-voltage insulators. On joining IBM at the Zurich Research laboratory in 1961, he first worked on fluid logic devices and circuits. From 1965 to 1972 he was engaged in the fabrication of Schottky-barrier field-effect transistors (MESFET) including thin epitaxial films of GaAs, leading to the realization of a 30-mHz GaAs MESFET. Since 1972 he has been engaged in studies of niobium Josephson tunnel junctions.

Allan J. Warnecke

Research Division, Yorktown Heights, New York

Mr. Warnecke joined the Josephson program at the Thomas J. Watson Research Center in 1973 and has been a staff member in the circuit technology group since 1974. Since joining IBM in 1961, he has worked in instrumentation for analytical chemistry and thin film measurement. His most recent assignment prior to joining the Research Division was in the thin film technology group at the System Products Division laboratory in East Fishkill, New York, where he was involved in the development of the LASER-VAMFO interferometer. Mr. Warnecke's education includes a B.A. in chemistry from Hartwick College, Oneonta, New York, received in 1960.

P. Wolf

Research Division, Zurich, Switzerland

Dr. Wolf received a B.S. degree from the University of Karlsruhe, Germany, in 1953, a diploma from the University of Darmstadt, Germany, in 1958, and a Ph.D. degree from the University of Mainz, Germany, in 1963, all in physics. In 1959 he joined the IBM Zurich Research laboratory and has worked on spin dynamics in thin magnetic films, on the dynamics of spin structures in rare-earth metals, and on microwave Schottky-barrier field-effect transistors (MESFETs). At present, he is manager of the device group, and since 1971 has been engaged in investigations on Josephson junctions. Dr. Wolf is a member of the German Physical Society.

Edward T. Yen

General Products Division, San Jose, California

Dr. Yen joined IBM in 1968 after graduating from the University of Missouri, Rolla, with an M.S. degree in metallurgical engineering. He received a Ph.D. degree in materials science in 1972 from Syracuse University, New York. His work interests include thin film physics and process technology, ion beam physics and process technology, and solid state diffusion mechanics. He is currently coordinating a portion of the process technology assurance activities at the General Products Division, San Jose, California. He is a member of the American Vacuum Society and Sigma Xi.

Hans H. Zappe

Research Division, Yorktown Heights, New York

Mr. Zappe studied electrical engineering at the Institut d'Electromecanique de Paris, France. His first position was with P.E.K. in Stuttgart, Germany, where he was involved in the design of special types of oscilloscopes. In 1956 he joined the IBM Corporation in France. Having gained work experience in computer servicing, he became technically responsible for all disk-file machines in France and in parts of North Africa. In 1961 he transferred to the advanced development group of the IBM France development laboratory, where he was first engaged in the development of magnetic film devices. He later concerned himself with problems of data transmission and telecommunication, with a prime interest in new filter concepts for automatic channel equalization. In 1965 he transferred to the IBM development laboratory in Poughkeepsie, New York, where he worked on the evaluation of thin magnetic film devices. This work led to the study of thermally induced anisotropy and magnetic after-effects in permalloy film materials. He continued this work until 1968, after joining the IBM Thomas J. Watson Research Center in 1966. In 1968, he engaged in the development of Josephson junction devices for both memory and logic applications and remained involved in this work. Currently he is manager of two research groups in this area. He received six IBM Invention Achievement Awards, an IBM Outstanding Contribution Award, and two IBM Outstanding Innovation Awards. Mr. Zappe is a member of the American Association for the Advancement of Science and the American Physical Society.