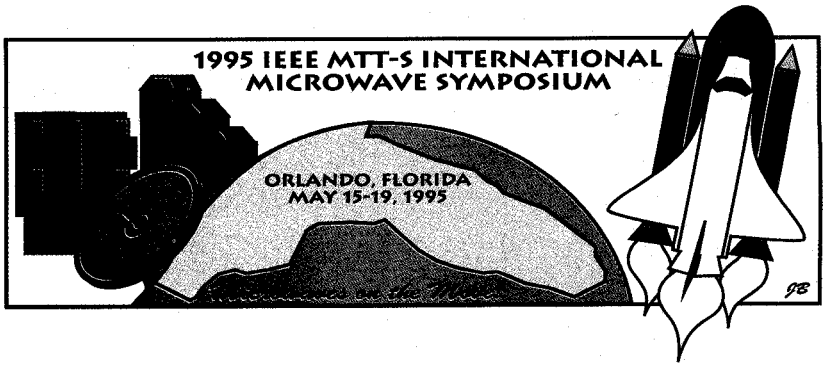
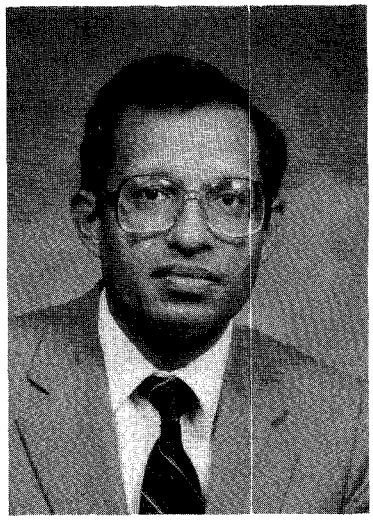
1995
IEEE MTT-S
INTERNATIONAL MICROWAVE SYMPOSIUM
DIGEST

1995 Awards



1995 N. Walter Cox Award

Dr. Krishna K. Agarwal (Kris)



The N. Walter Cox Award has been established in recognition of the qualities of N. Walter Cox and his service to the MTT Society prior to his untimely death in 1988. It is given aperiodically to a Society Volunteer whose efforts on behalf of MTT-S best exemplify his spirit and dedication.

This year's recipient is **Dr. Krishna K. Agarwal.** The citation reads: *"FOR EXEMPLARY SERVICE, GIVEN IN A SPIRIT OF SELFLESS DEDICATION AND COOPERATION."*

Dr. Krishna Agarwal is a Professor of Electrical Engineering in the School of Science and Engineering at the University of Bridgeport, Bridgeport, CT since 1993. He received his B.E. (Hons) degree in 1960 from Roorkee University, Roorkee (India), his Master of Technology degree in 1962 from Indian Institute of Technology, Kharagpur (India) and his Ph.D. degree in 1973 from North Carolina State University, Raleigh, NC, all in Electrical Engineering. In 1962, he served a one year fellowship at the Philips Research Labs., in Eindhoven (Neth.). He subsequently became a research fellow in microwave magnetized ferrites in the Electrical Engineering Department at the Technical University of Eindhoven (Neth.).

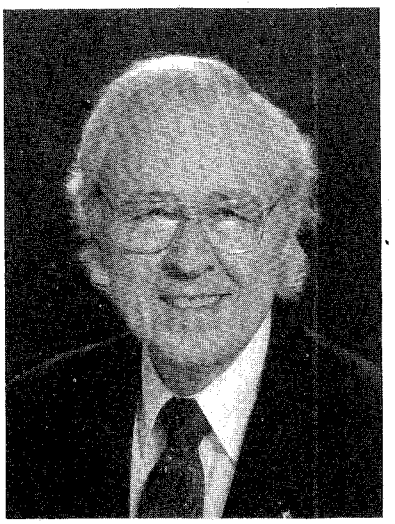
In 1967, Dr. Agarwal became a member of technical staff in the Transmission Systems Division at Bell Telephone Labs., North Andover, MA. His research work primarily addressed applied microwave circuits and GaAs FETs for low-noise and medium power applications. He was credited with the first insertion of a 6-GHz low-noise FET amplifier in the Single Sideband system of the Bell System network. From 1980 to 1982 at TRW and at Rockwell Collins from 1982 to 1987, he was manager of advanced microwave circuit technology for point-to-point digital radio systems. He joined E-Systems, Electronic Warfare Division in 1987 to manage the development of high performance wideband receiver systems. He was a member of the corporate science and technology advisory board and chairman of the MMIC committee at E-Systems. He was inducted in the E-Systems Hall of Fame in 1992 and further honored by E-Systems in 1993 when he was presented the highest award of E-Systems Corporation for his outstanding research efforts by the Chairman of the Board of Directors.

Dr. Agarwal has published over 25 papers in IEEE/MTT-S Transactions and other journals. He has presented many papers at International Microwave Symposia, chaired and organized several panel sessions and workshops. He has served on the IEEE Press Board and on MTT-S AdCom as Chairman of the Education Committee, Technical Committees and co-Chairman of Membership Services. He now serves as Chairman of the Distinguished Microwave Lecturer program of MTT-Society. He serves on the editorial boards of MTT-S Transactions, Microwave & Optical Technology Letters (Wiley) and Electronic Letters (London) and is a contributing editor to the Applied Microwave & Wireless magazine.

Dr. Agarwal is a Fellow of IEEE. He is a member of Eta Kappa Nu, Pi Mu Epsilon and Tau Beta Pi honor societies. A President of India Gold Medalist for merit, he received Philips, NASA and Ford Foundation fellowships for graduate studies. He enjoys jogging, gardening, and listening to light music.

1995 Microwave Career Award

William J. Getsinger



The Microwave Career Award is the highest honor bestowed by MTT-S. It recognizes an individual for a lifetime career of meritorious service and technical excellence in our field. This year's recipient is **William J. Getsinger.**

The award consists of a plaque, a certificate and a check for $2,000. The Career Award Citation reads: *FOR A CAREER OF MERITORIOUS ACHIEVEMENT AND OUTSTANDING CONTRIBUTIONS TO THE FIELD OF MICROWAVE THEORY AND TECHNIQUES.*

William J. Getsinger was born in 1924 in Waterbury, CT. He attended public schools in Watertown, CT. During World War II he was a flight radio operator with the Air Transport Command of the U.S. Army Air Force. After the war he attended the University of Connecticut, from which he received the degree of Bachelor of Science in Electrical Engineering in 1949.

In 1950 Mr. Getsinger began work as a design engineer of microwave components at Technicraft Laboratories in Thomaston, CT. In 1952 he moved to the Westinghouse Electric Corporation, Air Arm, where he designed airborne radar waveguide packages. In 1957 Mr. Getsinger joined the outstanding team of microwave research engineers headed by Dr. Seymour B. Cohn at Stanford Research Institute (SRI), where he worked on the theory and design of directional couplers, filters, antennas, amplifiers and microwave circuit elements. During his employment at SRI he attended Stanford University, earning the MSEE degree in 1959 and the degree of Engineer in 1961.

In 1962 Mr. Getsinger moved to MIT Lincoln Laboratory, where he continued research on microwave components, measurements and computer-aided design. At Lincoln Laboratory, he developed parametric amplifiers and also directed the development of GCP, one of the first interactive microwave circuit analysis programs. In 1969 he joined COMSAT Laboratories as Manager of the Low-Noise Receiver Department. While at COMSAT, he was Project Manager for design, development and production of centimeter-wave beacons orbited on four Bell Laboratory's COMSTAR satellites. In 1981, he was appointed a Senior Scientist at COMSAT. At the end of 1983, he left COMSAT and became a consulting engineer in the areas of microwave circuits and transmission lines.

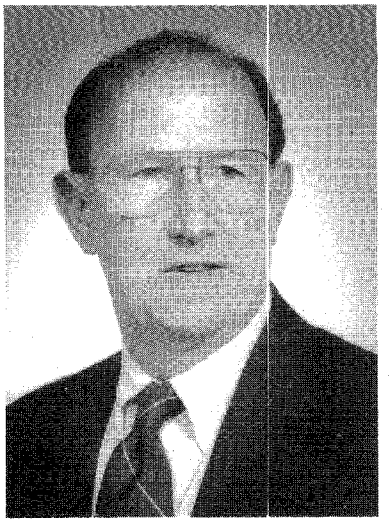
Mr. Getsinger's technical papers in IEEE publications span the years from 1960 to 1994.

Mr. Getsinger joined the IRE in 1948 and he was elected a Fellow of the IEEE in 1980. He organized and chaired technical sessions at various MTT-S International Microwave Symposia. For many years he was on the Editorial Board of the IEEE Transactions on Microwave Theory and Techniques. He was the first Chairman of the MTT-S Technical Committee on Computer-Oriented Microwave Practices. He was Guest Editor of the IEEE Transactions on Microwave Theory and Techniques Special Issue on Computer-Oriented Microwave Practices in 1969, and also Guest Editor of the MTT Transactions Special Issue of the 1986 International Microwave Symposium held in Baltimore.

William J. Getsinger is married to Doreen Catterall Getsinger; they have four grown children.

1995 Distinguished Educator Award

Dr. G.P. Rodrigue



The creation of this award was inspired by the untimely death of Professor F.J. Rosenbaum (1937-1992), an outstanding teacher of microwave science and a dedicated MTT-S AdCom member and contributor. This award is to be presented to a distinguished educator in the field of microwave engineering and science who exemplifies the special human qualities of the late Fred J. Rosenbaum, who considered teaching a high calling and demonstrated his dedication to MTT-S through tireless service.

The award consists of a plaque and an honorarium of $1,000. The awardee must be a distinguished educator, recognized, in general, by an academic career. It is desirable for the candidate to have received other teaching awards. The effectiveness of the educator should be supported by a list of graduates in the field of microwave science who have become recognized in the field. Relevant letters of support are encouraged. The candidate shall also have an outstanding record of research contributions documented in archival publications. The candidate shall have a record of many years of service to MTT-S.

The 1995 recipient is **Dr. G.P. Rodrigue**, Regents' Professor at the Georgia Institute of Technology.

Dr. G.P. Rodrigue received B.S. and M.S. degrees in physics from the Louisiana State University in 1952 and 1954, respectively. He then studied under Professor C.L. Hogan at Harvard University where he completed his Ph.D in applied physics in 1958. His dissertation dealt with microwave properties of ferrimagnetic garnets.

From August 1958 to August 1968 he worked for the Sperry Microwave Electronics Company in Clearwater, Florida. At Sperry he continued research on properties and microwave applications of ferrites, and worked on the development of parametric amplifiers, and microwave acoustic devices.

In 1968 he joined the faculty of the School of Electrical Engineering at Georgia Tech at the rank of Professor. He was made a Regents' Professor in 1977. At Georgia Tech he introduced new microwave course work at both the graduate and undergraduate levels, as well as in continuing education programs. His Ph.D students have concentrated on the general areas of microwave materials, transmission lines, and measurements and in superconductivity.

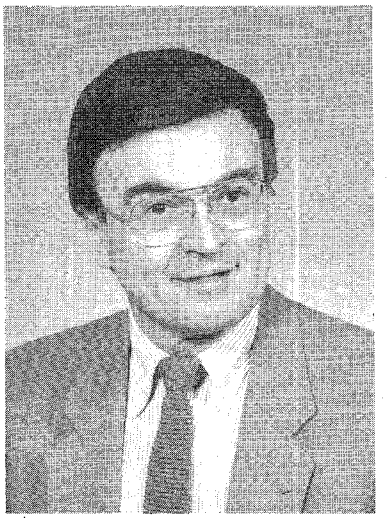
Dr. Rodrigue was an elected member of MTT-S AdCom from 1970 to 1979. He served as MTT-S President in 1976. He is a Fellow IEEE and has served on the IEEE Board of Directors, Executive Committee, Technical Activities, United States Activities, and Publications Boards. He was IEEE Vice President of Publication Activities in 1982 and 1983. He was chairman of the International Microwave Symposium Steering Committees in 1974 and again in 1993.

Georgia Tech Electrical Engineering seniors elected Dr. Rodrigue the Outstanding Teacher in Electrical Engineering in 1971 and in 1979. He received the Georgia Tech Outstanding Teacher Award in 1972. In 1984 he received the IEEE Region 3 Outstanding Engineering Educator Award. In 1984 he also received one of the IEEE Centennial Medals, and in 1985 the MTT-S Distinguished Service Award.

He and his wife, Mary, have been married for 40 years and have six children and four grandchildren.

1995 Distinguished Service Award

Dr. Reinhard K. Knerr



The Distinguished Service award is presented to honor an individual who has given outstanding service over a period of years for the benefit and advancement of MTT-S.

This year's honoree is **Dr. Reinhard H. Knerr,** AT&T Bell Laboratories. He has served MTT-S in a significant number of important positions over a period of many years.

The citation for the Distinguished Service Award reads: *"FOR HIS OUTSTANDING AND DEDICATED SERVICE TO THE SOCIETY."*

Dr. Reinhard H. Knerr received his Cand. Ing. degree in 1960 from Technical University of Aachen, Germany, Dipl. Ing. degree in 1962 from École Nationale Supérieure d'Hydraulique, d'Éléctronique de Toulouse, France, MSEE degree in 1964 from Lehigh University and Ph.D EE in 1968 from Lehigh University. His dissertation was on electro-magnetic propagation in nonreciprocal, gyrotropic materials.

Dr Knerr's honors include: 1961 - 62 German Government Scholarship to study in Toulouse, 1962 - 1963 Baldwin Scholar at Lehigh University, and 1964 NATO Scholar at Lehigh University studying plasma oscillations in thin silver films.

Dr. Knerr has been a Member of the Technical Staff of AT&T Bell Laboratories since 1968, where he has developed microwave ferrite devices, and solid state low noise and power amplifiers. He has held various management positions and has introduced microwave and lightwave products into manufacture in several AT&T factories in the U.S. and Europe. He is presently involved in the development of high reliability, lightwave components for submarine cable applications.

Dr. Knerr's MTT-S activities include: Fellow IEEE, MTT-S President 1986, MTT-S Transactions Editor, 1980-1982, Distinguished Microwave Lecturer, 1988-1989, Awards Chairman, 1992-1994, AdCom Member 1978-1986, Member of IEEE delegation to USSR, 1979, Co-Chairman of Technical Committee on MICs (MTT-6), 1976, Chairman of Technical Committee on MICs, 1977-1978, Member of Technical Committee on Microwave Ferrites (MTT-13), Assistant Chairman for MTT-S Technical Committees, 1978, MTT-S Guest Editor, 1978, Transactions Business Editor, 1979, Member of Editorial Board for Transactions on MTT since 1974, Member Publications Evaluation Committee, 1980-1982, Chairman, Publications Evaluation Committee, 1983, Representative and Founding Member of the Journal of Lightwave Technology, 1977-1978, Co-Representative to Lightwave Technology Council, 1983, Liaison Representative to New Jersey Coast, MTT/ED/QEA Chapter, 1983-1988, Liaison to Benelux MTT/AP Chapter, 1985-1994, Liaison to French MTT Chapter, 1989-1994, Representative to TAB 1986, Intersocietal Relations/Planning Activity Chairman, 1985, AdCom Advisory Committee Member, 1991-1992, Long Range Planning Committee Chairman, 1985, Past Presidents Council Chairman, 1993-1994.

His Accredited Standards Committees activities include: X3T9 - Management Committee for X3T9.2 (SCSI); X3T9.3 (Fibre Channel); X3T9.5 (Fiber Distributed Data Interface, FDDI); AT&T Voting Member (Principal) since 1985; X3T9.5 - FDDI; AT&T Principal Member since 1978, involved in the total evolution of the FDDI Standard; and X3T9.3 Fibre Channel; Alternate Voting Member since 1989.

1995 Microwave Prize

Dr. Frank Olyslager, Dr. Daniël De Zutter, and Krist Blomme

The Microwave Prize is awarded annually to the author or authors of a paper, published in the IEEE Transactions on MTT or any other IEEE publication, which is judged to be the most significant contribution in the field of interest of the Society in the calendar year preceding that in which the selection is made.

The 1995 Microwave Prize is awarded to **Dr. Frank Olyslager, Dr. Daniël De Zutter, and Krist Blomme** for their paper, "Rigorous Analysis of the Propagation Characteristics of General Lossless and Lossy Multiconductor Transmission Lines in Multilayered Media". Dr. Frank Olyslager was born in Wilrijk, Belgium, on November 24, 1966. He received the electrical engineering degree from the University of Ghent, Belgium, in 1989. From 1989 until 1993 he was a Research Assistant of the National Fund for Scientific Research of Belgium. In 1993 he obtained a Ph.D. degree from the Laboratory of Electromagnetism and Acoustics (LEA) of the University of Ghent with a thesis entitled "Electromagnetic Modelling of Electric and Dielectric Waveguides in Layered Media."

At present he is a Postdoctoral Researcher of the National Fund for Scientific Research of Belgium in the Department of Information Technology (the former LEA) of the University of Ghent. His research concerns the use of integral equation techniques to solve Maxwell's equations numerically. His activities focus on the electromagnetic wave propagation along high-frequency electrical and optical interconnections in multilayered isotropic and bianisotropic media, on the singularity of electromagnetic fields at edges and tips, and on the study of Green's dyadics in bianisotropic media. He is also investigating the construction of transmission line models for general waveguide structure and electromagnetic compatibility problems on printed circuit boards and microwave circuits.

His personal interests also include gravitational wavepropagation.

He is author or co-author of more than 20 papers in international journals and of 15 papers in conference proceedings. He is also co-author of the book "Electromagnetic and Circuit Modelling of Multiconductor Lines" published by Clarendon Press in 1993 in the Oxford Engineering Science Series. In 1994 he became laureate of the Royal Academy of Sciences, Literature and Fine Arts of Belgium.

Dr. Daniël De Zutter was born in Eeklo, Belgium, on November 8, 1953. He received a degree in electrical engineering from the University of Ghent, Belgium in 1976. From 1976 to 1984 he was a research and teaching assistant in the Laboratory of Electromagnetism and Acous-

tics (now the Department of Information Technology) at the same university. In 1981 he obtained a Ph.D. degree (dissertation: "Scattering and Radiation by Moving Objects and Sources") and he completed a thesis in 1984 titled "Electromagnetic Field and Force Calculations in the Presence of Moving Conductors and Moving Sources" leading to a degree equivalent to the French Aggrégation or the German Habilitation. He is now a professor at the Department of Information Technology, University of Ghent and Research Director of the National Fund for Scientific Research of Belgium.

Most of his earlier scientific work (under the supervision of Jean Van Bladel) dealt with the electrodynamics of moving media, with emphasis on the Doppler effect and on Lorentz forces. His research now focuses on all aspects of circuit and electromagnetic modelling of high-speed and high-frequency interconnections, on electromagnetic compatibility and electromagnetic interference topics and on indoor propagation. As author or co-author he has contributed to about 60 international journal papers and 70 papers in conference proceedings. He co-authored the book "Electromagnetic and Circuit Modelling of Multiconductor Lines", published by Clarendon Press in 1993 in the Oxford Engineering Science Series. In 1990 he was elected as a member of the Electromagnetics Society.

Krist Blomme was born in Eelko, Belgium, on October 17, 1968. He received the electrical engineering degree from the University of Ghent, Belgium, in 1991.

At present, Mr. Blomme is a Research Assistant of the National Fund for Scientific Research of Belgium in the Department of Information Technology of the University of Ghent. He is working towards the Ph.D degree in electrical engineering. During his licentiate thesis he studied polygonal waveguides embedded in layered media. In the first part of his Ph.D. research he investigated the incorporation of via holes, finite conductor thickness and air bridges in spectral Green's functions for layered media. At present he is studying the use of wavelets and related functions in the Method of Moments.

He is author or co-author of three papers in international journals and of six papers in conference proceedings.

1995 Pioneer Award
William C. Brown

The Pioneer Award recognizes contributions which have had major impact on our field and have stood the test of time. The basis for the nomination is an archival paper in the field of interest of MTT-S, published at least 20 years prior to the year of the award, i.e., it recognizes important technical contributions that have had a continuing impact on the practice of microwave engineering, for a period exceeding two decades.

The award consists of a plaque and a check for $1,000. The 1995 recipient is **W.C. Brown.** His citation reads *"FOR PIONEERING WORK ON CROSSED FIELD AMPLIFIERS OR PLATINOTRONS."*

William C. Brown received the BSEE from Iowa State University in 1937 and the MSEE from M.I.T in 1941. He is a Life Fellow of the IEEE.

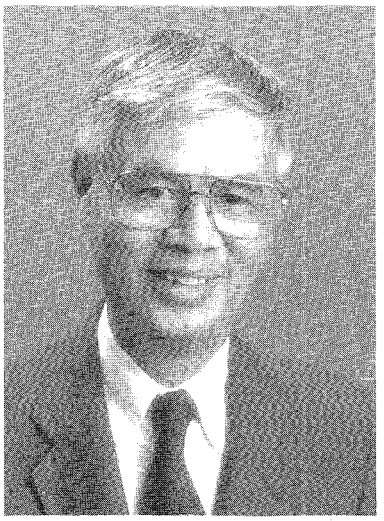
He joined the Raytheon Co. in 1940, and became involved in making improvements on the design of magnetrons that were used in all World War II microwave radar. However, magnetrons are oscillators and were not suitable for the next generation of radars that needed an efficient, high powered and broadband amplifier. In 1952 he made a major contribution in fulfilling that need by converting the magnetron oscillator into a broadband amplifier. This device, variously referred to as the "platinotron", "Amplitron" or simply as the "CFA" (for crossed field amplifier) found immediate military and civil applications that include the Navy Aegis radar, the Hawk and Patriot Missile Systems, commercial air route surveillance radar, and the high data rate communications system in the Apollo lander that sent televised images from the moon to Earth.

Mr. Brown then proposed that the CFA be developed into a super power amplifier and the resulting DODcontract produced a CFA that generated 425 kW of continuous power with an efficiency of 76 percent at the frequency of 3 GHz. One of the proposed applications of this much power was the efficient wireless transmission of large amounts of power from one point to another. The public was first alerted to this application by the nationally televised demonstration in 1964 of a tethered microwave powered helicopter at Raytheon's Spencer Laboratory.

Mr. Brown retired from Raytheon in 1984 and has since been active as a consultant and as a spokesperson for wireless power transmission. Under the sponsorship of IBM and Northeastern University he made a series of four videotaped lectures on its technology and applications. He has published more than 70 papers and has 50 issued patents in the areas of microwave tube technology and wireless power transmission.

1995 Microwave Application Award

Dr. Cheng P. Wen



The Microwave Application Award is presented aperiodically to individuals for an outstanding application of microwave theory and techniques. The eligibility requirements are creation of a new device, component, or technique, novel use of components, or both. The award consists of a plaque, certificate, and a check for $1000.

The 1995 recipient of the award is **Dr. Cheng P. Wen**. The award citation reads: *"FOR THE INVENTION AND DEVELOPMENT OF THE CO-PLANAR WAVEGUIDE AND FOR THE APPLICATION OF THE WAVEGUIDE TO VARIOUS MICROWAVE STRUCTURES"*.

Dr. Cheng P. Wen received his BS, MS and Ph.D. degree in Electrical Engineering in 1956, 1957, and 1963, respectively, all from the University of Michigan, Ann Arbor, Michigan. From 1955 to 1963, he was employed by the University of Michigan Electron Physics Laboratory as a research assistant. During this period, he worked on traveling-wave amplifiers, leading to his dissertation in "Noise Propagation in Two-Dimensional Electron Streams".

In 1963, he joined the Microwave Research Laboratory of the RCA Laboratories (David Sarnof Research Center), Princeton, New Jersey, where he conducted research on ultra-low noise traveling-wave amplifiers, gas lasers, microwave acoustics, ferromagnetic semiconductors, microwave magnetics in integrated circuits and millimeter-wave avalanche diodes. His accomplishments included the demonstration of the lowest noise traveling-wave amplifier, the construction of the first surface acoustic wave coder/decoder, the operation of a electronic laser color switch, the development of coplanar waveguide (an alternate integrated circuit transmission medium), and the development of high power mm-wave IMPATT devices. He was a recipient of the RCA Laboratory Outstanding Achievement Awards in 1964, 1969 and 1973.

Dr. Wen joined Rockwell International Corporation in 1974 and established a microwave device research activity at the Science Center, Thousand Oaks, California. Subsequently, he transferred to the Rockwell Electrons Division to develop manufacturing technology for discrete microwave devices.

In 1982, Dr. Wen joined the Hughes Aircraft Company in Torrance, California. He has provided leadership to technical teams to develop solid-state devices/components and to transition technology from research and development to manufacturing. Accomplishments include the development of an ultra-high power millimeter-wave IMPATT diode (25-watt pulsed power output at W-band frequencies) and the demonstration of a Gamma-radiation hard, superlattice long-wavelength infrared detector with built-in intrinsic event discrimination capability. He is currently leading a project team to engage in the development of a coplanar waveguide based, dielectric coated, flip-chip monolithic microwave integrated circuit technology. He is also in charge of establishing magnetoresistance position sensor chip manufacturing at Hughes Microelectronics Division for automotive applications. He also held a part-time teaching position under a Hughes microwave engineering program at California State University, Northridge, in the 1980s.

Dr. Wen has published more than 30 technical papers on microwave solid-state devices and circuits, lasers, acoustic devices, traveling-wave amplifiers and infrared detectors. He has been awarded 27 U.S. patents. Dr. Wen is a Senior Member of the IEEE and a member of the American Physical Society, Sigma Xi, Eta Kappa Nu and Tau Beta Pi.

1995 IEEE Fellow Awards

Twelve MTT-S members who were evaluated by our Society were elected to the grade of Fellow, effective January 1, 1995. The grade of Fellow is conferred in recognition of unusual professional distinction. It is awarded at the initiative of the IEEE Board of Directors after a rigorous nomination and evaluation process. Individuals receiving this distinction have demonstrated extraordinary contributions to one or more fields of electrical engineering, electronics, computer engineering and related sciences. This grade is not conferred automatically on nomination; only a fraction of those nominated are honored by elevation to the grade of Fellow IEEE.

Jerry C. Aukland

For leadership in the research and development of multi-gigahertz transistor and device technology.

Dr. John B. Davies

For contributions to computer-aided engineering of optical and microwave devices, and the advancement of finite element methods for electromagnetic field analysis.

Dr. Lionel E. Davis

For contributions to the development of novel circuit configurations using nonreciprocal media.

Dr. Robert L. Eisenhart

For contributions to the modeling, design, and measurement of microwave circuits and antennas.

Dr. Lawrence E. Larsen

For pioneering the application of microwaves to therapeutic and diagnostic medical devices.

Mr. John A. Pierro

For contributions to solid-state microwave low noise amplifiers, and integrated circuit developments.

Dr. Peter A. Rizzi

For contributions to microwave education, and the innovativedesign of microwave filters and ferrite components.

Dr. Klaus Schuenemann

For contributions to the analysis, modeling, and design of active and passive microwave components.

Mr. Richard A. Sparks

For leadership in the development, application, and manufacture of solid-state microwave devices for missile and radar systems.

Dr. Barry E. Spielman

For leadership in research and teaching in the microwave and millimeter-wave integrated circuits area.

Dr. Peter W. Staecker

For leadership and contributions to the design and development of microwave and millimeter-wave devices and circuits.

Mr. Britton T. Vincent, Jr.

For contributions to the development of solid-state phased-array radar systems and hybrid microwave integrated circuits.

The following, new Fellows are also MTT members but were evaluated by other IEEE Societies:

Mr. Renato G. Bosisio

For contributions to microwave instrumentation, computer-aided measurements, and microwave power applications.

Dr. John R. Brauer

For contributions to finite element analysis of electromagnetic devices.

Dr. Christopher T.M. Chang

For contributions to the development of GaAs high-speed digital circuits.

Dr. George Costache

For leadership in the application of the finite element method to the predictions of crosstalk on printed circuit boards.

Dr. Jacques J. Gavan

For contributions to the solution of cosite electromagnetic interference problems in communication systems and to electromagnetic compatibility education.

Dr. Gota Kano

For contribution to research, development, and industrialization of GaAs devices, particularly UHF FET integrated circuits and lasers for consumer applications.

Dr. Linda P.B. Katehi

For contributions to phased array packaging and high-frequency characterization of novel feeding networks for printed antennas and arrays.

Dr. Adalbert Konrad

For contributions to eddy current field computation by finite element methods.

Dr. Friedrich Landstorfer

For contributions to antenna theory.

Dr. Raymond J. Luebbers

For contributions to computational electromagnetics.

Mr. Umesh K. Mishra

For contributions to low-noise high-electron mobility transistors (HEMTs) and compound semiconductor device technology.

Dr. Gary K. Montress

For contributions to the development of surface acquisition wave (SAW) based frequency sources, and for leadership in their application to high performance military radar systems.

Mr. Koji Nihei

For contributions to thin film technology and printhead development.

Dr. Ronald J. Pogorzelski

For contributions to the techniques of analytical and computational electromagnetics.

Mr. Helmut E. Schrank

For contributions to antenna design and practice.