

## Contributors to This Issue

**James L. Blue**, A.B., 1961, Occidental College; Ph.D., 1966, California Institute of Technology; Bell Laboratories, 1966—. Mr. Blue has done research in noise theory for avalanche diodes and in modeling of semiconductor devices, and was involved in the development of computer aids for testing of integrated circuits. He is now a member of the Computing Mathematics Research Department, where he is involved in mathematical modeling, research in numerical methods, and the development of numerical software.

**Ronald E. Crochiere**, B.S., (E.E.) 1967, Milwaukee School of Engineering; M.S. (E.E.) and Ph.D. (E.E.), 1968 and 1974, Massachusetts Institute of Technology; Raytheon Co., 1968–1970; Bell Laboratories, 1974—. Mr. Crochiere is presently engaged in research activities in speech communications, speech coding, and digital signal processing. Member, IEEE, Sigma Xi, ASSP-DSP Subcommittee.

**Adolf J. Giger**, Diploma E. E., 1950, and Dr. Sc. Techn., 1956, Swiss Federal Institute of Technology; Bell Laboratories, 1956—. He has worked in the field of microwave communications, including work on TH-1 and its associated protection switching system, on low-noise receivers, waveguide circuits, antennas and autotracking for Telstar, and on the digital systems and circuit aspects of the WT-4 millimeter waveguide system. As head of a microwave radio department he has been responsible for the development of new analog and digital radio equipment and the current engineering on existing radio systems. Senior member, IEEE.

**David J. Goodman**, B.E.E., 1960, Rensselaer Polytechnic Institute; M.E.E., 1962, New York University; Ph.D. (E.E.), 1967, Imperial College London; Bell Laboratories, 1967—. Mr. Goodman has studied various aspects of digital communications, including analog-to-digital conversion, digital signal processing, assessment of the quality of digitally coded speech, and error mechanisms in digital transmission lines. In 1974 and 1975, he was a Senior Research Fellow at Imperial College, London, England. Member, IEEE.

**B. Gopinath**, M.Sc. (Mathematics), 1964, University of Bombay; Ph.D. (E.E.), 1968, Stanford University; research associate, Stanford University, 1967-1968; Alexander von Humbolt research fellow, University of Göttingen, 1971-1972; Bell Laboratories, 1968—. Mr. Gopinath is engaged in applied mathematics research in the Mathematics and Statistics Research Center.

**D. C. Hogg**, B.Sc., 1949, University of Western Ontario; M.Sc., 1950, Ph.D., 1953, McGill University; Bell Laboratories, 1953-February 1977 (retired). Mr. Hogg's work included studies of artificial dielectrics for microwaves, diffraction of microwaves, and over-the-horizon, millimeter wave, and optical propagation and antenna research. Mr. Hogg is now Chief, Environmental Radiometry, at the Wave Propagation Laboratory, Environmental Research Laboratories, National Oceanic and Atmospheric Administration, Boulder, Colorado. Fellow, IEEE, and Union de Radio Scientifique Internationale.

**Frank K. Hwang**, B.A., 1960, National Taiwan University; M.B.A., City University of New York; Ph.D. (statistics), 1968, North Carolina State University; Bell Laboratories, 1967—. Mr. Hwang visited the Department of Mathematics of National Tsing-Hua University in 1970, and the Institute of Mathematics, Academia Sinica and Telecommunication Laboratories in 1976. He has been engaged in research in statistics, computing algorithms, discrete mathematics, and switching networks.

**T. C. Liang**, B.S. (math.), 1972, and M.S. (applied math.), 1976, National Tsing-Hua University, Telecommunication Laboratories, 1976—. Mr. Liang has been engaged in research in statistics and switching networks.

**Sing-Hsiung Lin**, B.S.E.E., 1963, National Taiwan University; M.S.E.E., 1966, and Ph.D., 1969, University of California, Berkeley; Bell Laboratories, 1969—. At the Electronics Research Laboratory, University of California at Berkeley, Mr. Lin was engaged in research on antennas in plasma media and numerical solutions of antenna problems. Mr. Lin is presently working on wave propagation problems on terrestrial radio systems and earth-satellite radio systems. Member, IEEE, Sigma Xi, AIAA.

**A. C. Longton**, B.S.E.E., 1954, Tufts University, M.S.E.E., 1962, Northeastern University; Bell Laboratories, 1954—. Mr. Longton has worked on the exploratory development of PCM systems. He supervised the development of channel units with built-in interoffice signaling for the T1 carrier system. He has supervised the development of IF circuits for the TD-3 microwave radio system and held a number of responsibilities on radio system developments. In 1966 he became head of a department responsible for short-haul radio and the development of radio protection switching systems. In 1969 he became responsible for exploratory studies of digital radio systems and currently heads the Digital Radio Department.

**Debasis Mitra**, B.Sc. (E.E.), 1964, and Ph.D. (E.E.) 1967, London University; Bell Laboratories, 1967—. Mr. Mitra has worked on the stability analysis of nonlinear systems, semiconductor networks, analysis of queues in communication systems, computer memory management, growth models for new communication services, and speech waveform coding. Most recently he has been involved in the analysis of adaptive systems and digital filters. Member, IEEE and SIAM.

**John A. Morrison**, B.Sc., 1952, King's College, University of London; Sc.M., 1954, and Ph.D., 1956, Brown University; Bell Telephone Laboratories, 1956—. Mr. Morrison has done research in various areas of applied mathematics and mathematical physics. His recent interests have included stochastic differential equations and propagation in random media, electromagnetic scattering by raindrops, and the high-frequency propagation of surface waves. He was a visiting professor of mechanics at Lehigh University during the fall semester 1968. Member, American Mathematical Society, SIAM, Sigma Xi.

**Erwin E. Muller**, B.S., 1952, Stevens Institute of Technology; M.S., 1954, University of California; Bell Laboratories, 1954—. Mr. Muller has worked on design of ballistic missile guidance computers, single-sideband long-haul radio systems, and satellite communications systems. He is head of the Transmission Systems Characterization Department, concerned with describing the operational environment of radio and wire-pair transmission systems. Senior member, IEEE.

**Arun N. Netravali**, B. Tech. (Honors), 1967, Indian Institute of Technology, Bombay, India; M.S., 1969, and Ph.D. (E.E.), 1970, Rice

University; Optimal Data Corporation, 1970-1972; Bell Laboratories, 1972—. Mr. Netravali has worked on problems related to filtering, guidance, and control for the space shuttle. At Bell Laboratories, he has worked on various aspects of signal processing. Member, Tau Beta Pi, Sigma Xi.

**Thomas L. Osborne**, B.S.E.E., 1961, M.S.E.E., 1963, Auburn University; Bell Laboratories, 1963—. Initially, Mr. Osborne was involved in research on microwave radio systems and related topics including microwave mixers, microwave integrated circuits, injection-locked oscillators, and rain attenuation. Since 1972, he has been supervisor of a group involved in circuit and system development of digital microwave radio systems. Member, Sigma Xi, Phi Kappa Phi, Tau Beta Pi, Eta Kappa Nu, Pi Mu Epsilon.

**Lawrence R. Rabiner**, S.B. and S.M., degrees, 1964, and Ph.D. (electrical engineering), 1967, Massachusetts Institute of Technology. Bell Laboratories, 1962—. Mr. Rabiner has worked on digital circuitry, military communications problems, and problems in binaural hearing. Presently he is engaged in research on speech communications and digital signal processing techniques. Member, of Eta Kappa Nu, Sigma Xi, Tau Beta Pi; fellow, the Acoustical Society of America and IEEE.

**Marvin R. Sambur**, B.E.E., City College of New York, 1968; S.M., 1969, and Ph.D., 1972, Massachusetts Institute of Technology; Bell Laboratories, 1968-1977. Mr. Sambur was engaged in automatic speaker verification and automatic speech recognition research in the Acoustics Research Department. He is currently with the Defense Communications Division of ITT. Member, MPA-TC subcommittee on Speech Recognition and Understanding, Eta Kappa Nu, Tau Beta Pi, Sigma Xi.

**David J. Thomson**, B.S., 1965, Acadia University; MS, 1967, Ph.D., 1971, Polytechnic Institute of Brooklyn; Bell Laboratories, 1965—. Mr. Thomson has been involved in analysis of multipair and coaxial cable. He also worked on WT4 in measurement, analysis, and specification of geometric imperfections in addition to time series analysis and spectrum estimation techniques. Currently Mr. Thomson is working on the high-capacity mobile telephone system. Member, IEEE, IMS, SIAM.