Contributors to This Issue

FRANK J. ANDROSKI, A.E.E., 1961, Wentworth Institute; Bell Telephone Laboratories, 1961—. Mr. Androski has worked on the TL-1, TL-2, and TM-1 short-haul microwave radio systems, the TH-1 long-haul microwave radio system, and the 4A FM terminal receiver. He is presently working on the 3A wire line entrance link.

JAMES F. BALICKI, B.E.E., 1960, University of Detroit; M.E.E., 1962, New York University. Mr. Balicki has worked for Michigan Bell Telephone Company as a Student Engineer in 1957 and 1958, and for Bell Telephone Laboratories as a Member of Technical Staff from 1960 to 1970. At Bell Laboratories he planned power systems and developed power supplies for station, PBX, special customer, carrier, coaxial, multiplex, and microwave systems. He joined American Telephone and Telegraph Company in July, 1970, as an Assistant Engineering Manager in the Special Customer Systems group of the Engineering Department, where he is responsible for power systems on customer premises and for emergency reporting systems, including private line telephone systems, group alerting systems, and answering bureau equipment for the universal emergency number (911) system. Member, Public Fire Service Communications Committee of the National Fire Protection Association, Eta Kappa Nu, Tau Beta Pi.

HARRY R. BEDELL, B.S.E.E., Northeastern University; Bell Telephone Laboratories, 1953—. Mr. Bedell completed the Bell Laboratories Communications Development Training Program in 1956 and worked on telephone answering equipment in the station apparatus area. In 1958 he transferred to the transmission systems area to work on the development and physical design of the cable repeater for the T1 carrier system. In 1963 he began work in the Radio Laboratory on the physical design of microwave generators for the TD-3 and TH-3 systems. His current responsibilities include the physical design of the TH-3 transmitter-receiver bay, associated equipment components, and test equipment. Member, Eta Kappa Nu.

C. E. Bradford, B.S. (E.E.), 1942, Worcester Polytechnic Institute; M.S. and Ph.D. (Nuclear Physics), 1954, Illinois Institute of Technology; Bell Telephone Laboratories, 1954—. Mr. Bradford started in Bell Laboratories with an investigation of the effect of manufacturing tolerances on electron guns, and has been involved in designing and developing Bell System and military traveling-wave tubes, Bell System masers, and military magnetrons. For a number of years he was responsible for design engineering for traveling-wave tubes in production by the Western Electric Company. He is presently engaged in developing the characterization of millimeter-wave diodes for the millimeter waveguide system. Member, IEEE, A.I.P., Sigma Xi.

Ping S. Chun, B.A. (Chemistry), 1955, University of Hawaii; B.S.E.E., 1962, University of Pennsylvania; M.E.E., 1964, New York University; Bell Telephone Laboratories, 1962—. Mr. Chun has been principally engaged in the development of electronic power conditioners for military and microwave radio systems. His present responsibilities include energy systems planning for data communications, waveguide, carrier, and digital transmission systems. Member, IEEE, Eta Kappa Nu, Tau Beta Pi.

Richard T. Cooney, B.S.E.E., 1959, University of Rhode Island; M.S.E.E., 1962, Northeastern University; Bell Telephone Laboratories, 1959—. Mr. Cooney's work has included designing and developing analog portions of the 100A protection switching system, developing the TD-3 transmitter-receiver test set, and a noise reduction program on the TH radio system. Since 1967 he has been concerned with the design of new protection switching systems including the 300A and auxiliary channel switching systems. Member, IEEE, Eta Kappa Nu, Tau Beta Pi, Phi Kappa Phi.

N. R. Dietrich, Electronic Technology, 1959, RCA Institutes; B.S.E.E., 1966, Lafayette College; Graduate studies, 1968—, Lehigh University; Bell Telephone Laboratories, 1959—. Mr. Dietrich has been active in the development of traveling-wave maser amplifiers for the *Telstar*® project, and microwave ferrite devices and integrated circuits for radio relay applications. He is currently working on the development of lumped element circulators for the high-capacity mobile telephone system. Member, IEEE, Tau Beta Pi, Eta Kappa Nu.

Elbert J. Drazy, B.S.E.E., 1942, Purdue University; Bell Telephone Laboratories 1942—. Mr. Drazy has been concerned with de-

veloping test equipment for microwave radar and for microwave radio relay and video transmission systems, as well as developing carrier supplies for the L-type multiplex equipment, and FM terminals for long-haul microwave radio relay systems. Since 1964 he has supervised a group developing microwave networks for radio systems. Member, Tau Beta Pi, Eta Kappa Nu, Sigma Xi.

GERALD L. FENDERSON, B.S.E.E., 1960, University of Maine; M.S.E.E., 1963, Northeastern University; Bell Telephone Laboratories, 1960—. Mr. Fenderson has been primarily concerned with the development of IF amplifiers for solid state microwave radio systems.

GERARD J. FOSCHINI, B.S.E.E., 1961, Newark College of Engineering; M.E.E., 1963, New York University; Ph.D. (Mathematics), 1967, Stevens Institute of Technology; Bell Telephone Laboratories, 1961—. Mr. Foschini initially worked on real-time program design. Since 1965 he has mainly engaged in analytical work concerning the transmission of signals over stochastic channels. Member, Sigma Xi, Mathematical Association of America, American Men of Science, New York Academy of Sciences.

O. GIUST, Assoc. E.E., 1959, Franklin Technical Institute; Bell Telephone Laboratories, 1959—. Initially Mr. Giust worked on the TH-1 radio system and has since contributed to the design of the 100A protective switching system and the microwave generator for the TD-3 and TH-3 radio systems. Currently he is doing development work on the TH-3 radio system.

HERBERT D. GRIFFITHS, B.S., 1949, University of Western Ontario; M.S., 1950, McGill University; Bell Telephone Laboratories, 1954—. Mr. Griffiths has been involved in the development of microwave radio and its associated protection switching systems. In recent years he has been supervising a group responsible for the design of new protection switching systems including the 100A, the 300A, and the auxiliary channel switching systems. His group is now designing the 400A protection switching system.

ANDRAS HAMORI, Dipl. Eng., E.E., 1955, Technical University of Budapest, Hungary; Bell Telephone Laboratories, 1957—. Mr. Hamori was initially concerned with the final development of the D1 channel bank and the line repeater for the T1 carrier system. Later he worked

on the development of the 100A protection switching system and the TD-3 radio relay system. He was the supervisor of the group responsible for the circuit development of the TH-3 radio transmitter and receiver bay. Presently, his group is developing digital terminals for radio systems.

ROBERT M. JANSEN, B.E.E., 1966, Villanova University; M.S.E.E., 1967, Stanford University; Bell Telephone Laboratories, 1966—. Mr. Jansen's first assignment was in system and test equipment analysis for the TD-3 radio system. Later he transferred to system analysis work on the TH-3 radio system. Currently, he is also teaching the Transmission Systems Design course at the Merrimack Valley Laboratory. Member, IEEE, Tau Beta Pi, Eta Kappa Nu.

R. M. JENSEN, B.S. in E.E., 1937, Purdue University; Bell Telephone Laboratories, 1937—. Mr. Jensen first was engaged in developing audio equipment, and then worked in quality assurance. In 1938 he began developing L-type multiplex networks, and during World War II he was concerned with tuned amplifiers, coaxial filters, and crystal-controlled oscillators. In 1956 Mr. Jensen was assigned to develop microwave networks, and in 1959 he became a supervisor. In 1964 he began supervising a group designing equipment for TL-2/TM-1 radio relay, FM terminals, wire line entrance link, TD-3 radio relay, and then TH-3 radio. Now his group is designing digital radio relay equipment. Member, Sigma Pi Sigma.

ROBERT W. JUDKINS, Bell Telephone Laboratories, 1954—. Mr. Judkins' early work was directed towards design and development of microwave ferrite non-reciprocal devices and microwave switches. Since 1960, he has been engaged in design and development of microwave circuits, such as upconverters, frequency multipliers, and waveguide networks, for use in the TD-3 and TH-3 radio systems.

J. W. KNAPP, B.S.E.E., 1963, University of Massachusetts; M.S.E.E., 1965, Northeastern University; Bell Telephone Laboratories, 1963—. Since joining Bell Laboratories, Mr. Knapp has been involved in both circuit and system design work for short-haul and long-haul microwave radio systems. He is currently developing circuits for application on a frequency-diplexed auxiliary channel for long-haul radio systems. Member, Tau Beta Pi, Eta Kappa Nu, Phi Kappa Phi.

ROBYE L. LAHLUM, B.S., 1963, North Dakota State University; M.S.E.E., 1965, Northeastern University; Bell Telephone Laboratories, 1963—. Mr. Lahlum has worked on IF amplifiers for the TD-3 system and on the microwave generator for the TD-3 and TH-3 systems. At the present time, he is working on digital circuits for a millimeter-wave radio system called digital radio. Member, Tau Beta Pi.

FREDERICK H. LANIGAN, Bell Telephone Laboratories, 1952—. After early work on the automatic protection switching system for TD-2 radio channels (TDAS), Mr. Lanigan was involved for several years with the current engineering problems of the automatic protection switching system of TH radio (THAS). He was then assigned to work on the development of the logic and control circuits for the 100A protection switching system. More recently he has been engaged in the development of the logic and control circuits of the 300A protection switching system, and at present is assigned to the development of logic and control circuits for the 400A protection switching system.

N. E. LENTZ, B.S.E.E., 1952, Washington State University; Bell Telephone Laboratories, 1952—. Mr. Lentz completed Bell Laboratories' Communications Development Training Program in 1955, and worked on video amplifiers and test equipment for the TD-2 radio system. Mr. Lentz holds several patents for the timing circuits he designed for the T-carrier PCM system. He developed circuits for the 3A and 4A FM terminals and a squelch circuit for the 3A wire line entrance link. He is now designing circuits for the radio digital terminal.

S. C. LIU, B.S.C.E., 1960, National Taiwan University; M.S., 1964, and Ph.D., 1967, University of California at Berkeley; Bell Telephone Laboratories, 1967—. Mr. Liu has been working in the areas of mechanical vibrations, random processes, structural dynamics, and earthquake engineering. Member, American Society of Civil Engineers, Seismological Society of America.

JAMES P. MORELAND, B.S.E.E., 1964, M.Sc., 1964, and Ph.D., 1967, The Ohio State University; Instructor, 1961–64, Research Associate, Electro Science Laboratory, 1964-68, and Assistant Professor, 1967–68, The Ohio State University; Bell Telephone Laboratories, 1968—. Mr. Moreland has worked on optical communications systems and, since

1968, has been primarily concerned with systems engineering problems associated with digital communications. Member, IEEE, Sigma Xi, Tau Beta Pi, Eta Kappa Nu.

DAVID J. PARIS, B.S.E.E., 1966, Drexel University; M.S.E.E., 1968, Columbia University; Bell Telephone Laboratories, 1966–1971. Mr. Paris has concentrated on the development of multiphase data sets for commercial applications. Member, IEEE, Tau Beta Pi, Eta Kappa Nu, Phi Kappa Phi.

RONALD C. PRIME, B.Sc. in E. E., 1958, University of Southampton (England); M.S.E., 1961, Princeton University; Bell Telephone Laboratories, 1961—. Mr. Prime's first assignment with Bell Laboratories was to design the receiving logic for the 100A switching system which is used to protect TD and TH-3 radio. Later he transferred to systems analysis work on the TD-3 radio relay system. He is now supervisor of the Systems Planning and Applications Group, responsible for TH-3 radio. Graduate member, IEE.

CLYDE L. RUTHROFF, B.S.E.E., 1950, and M.A., 1952, University of Nebraska; Bell Telephone Laboratories, 1952—. Mr. Ruthroff has published contributions on the subjects of FM distortion theory, broadband transformers, FM limiters, threshold extension by feedback, and microwave radio systems for satellite and terrestrial use. He is interested in the extension of radio communication into the millimeter and optical wavelengths. Member, IEEE, Sigma Xi, American Association for the Advancement of Science.

ROBERT C. SALVAGE, Associate degree in E.E., 1955, Newark College of Engineering; Western Electric Co., 1953–1955; Bell Telephone Laboratories, 1955—. Mr. Salvage started work on the TD-2 microwave system and has since contributed to designs for the TJ, TL, and TM short-haul microwave systems. He has worked on developing FM terminals since 1963, completing the first solid state terminal in 1967. Currently he is working on in-service testing of radio transmission systems.

FRANK J. SALVO, B.S.M.E., 1968, Polytechnic Institute of Brooklyn; Bell Telephone Laboratories, 1953—. Since 1962, Mr. Salvo has been a member of the Power Systems Physical Design Department with equipment design responsibilities for dc/dc converters used in micro-

wave, carrier, and submarine cable systems. He is presently involved in the design of general-use power supplies for Central Office *Picturephone*® trunk services and waveguide transmission systems.

J. SALZ, B.S.E.E., 1955, M.S.E., 1956, and Ph.D., 1961, University of Florida; Bell Telephone Laboratories, 1961—. Mr. Salz first worked on the remote line concentrators for the electronic switching system. He has since engaged in theoretical studies of data transmission systems, and is currently a supervisor in the data theory department. During the academic year 1967–68 he was on leave as Professor of Electrical Engineering at the University of Florida. Member, IEEE, Sigma Xi.

MICHAEL A. SCHUMER, B.E. (E.), 1964, City College of New York; M.A., 1966, and Ph.D., 1968, Princeton University; Raytheon Research Division, 1967–1969; Bell Telephone Laboratories, 1964–1965 and 1969—. In his earlier association with Bell Laboratories, Mr. Schumer was engaged in the design of diagnostic tests for No. 1 ESS. He has been involved in research in communication theory and optimization techniques. He is presently engaged in switching systems planning for the local area. Member, IEEE, Eta Kappa Nu.

K. L. SEASTRAND, B.S.E.E., 1959, Worcester Polytechnic Institute; M.S.E.E., 1961, Northeastern University; Bell Telephone Laboratories, 1959—. Mr. Seastrand was engaged in developing test equipment associated with the T1 carrier repeatered line. Later he also worked on the development of the TL-2 and TM-1 radio systems. He presently supervises a group which had the responsibility for developing the frequency-diplexed auxiliary channel and the medium-haul application of TH-3. Member, IEEE.

JOHN R. SHEEHAN, B.S.E.E., 1962, Drexel University; M.E.E., 1964, New York University; Bell Telephone Laboratories, 1962—. Mr. Sheehan has been concerned with problems in data transmission. His work has included problems relating to signal design, modem design, and automatic equalization techniques. He currently supervises a group concerned with modem development.

R. E. SHEEHEY, E.E., Assoc., 1960, Wentworth Institute; Bell Telephone Laboratories, 1960—. Mr. Sheehey has been involved in devel-

oping various types of electrical networks, and is now designing and developing networks for radio systems.

R. A. SWIFT, B.S.E.E., 1943, Union College; Bell Telephone Laboratories, 1946—. Mr. Swift has been engaged in the mechanical and equipment design aspects of Bell System and military systems. He supervised the groups responsible for the mechanical design and evaluation of missile-borne guidance equipment for the Titan and Thor-Delta Missiles and the *Telstar*® satellite. At present, he supervises a group responsible for the equipment design of microwave radio systems.

C. J. WALDRON, B.S. (Mathematics), 1970, Albright College; Bell Telephone Laboratories, 1957—. Mr. Waldron has worked on development of reflex klystrons for application in the TH and TJ microwave systems. Since 1961 he has been involved in the development of traveling-wave tubes for Bell System applications.

HAN-CHIU WANG, B.S.E.E., 1955, Cheng-kung University, Taiwan, China; M.S.E.E., 1960, University of Notre Dame; Ph.D., 1965, Polytechnic Institute of Brooklyn; Chinese Government Radio Adm., 1956–1958; Polytechnic Institute of Brooklyn, 1964–1965; Bell Telephone Laboratories, 1965—. Mr. Wang is currently engaged in developing millimeter wave components for the waveguide transmission system.

DONALD S. WILLIAMS, B.S.E.E., 1966, University of Washington; M.S.E.E., 1968, Northeastern University; Bell Laboratories, 1966—. Mr. Williams was involved in the initial system planning and development of the TH-3 radio system and has worked on various system problems. He is now concerned primarily with TH-3 medium-haul applications and system problems unique to the Telephone Operating Companies. Member, IEEE, Tau Beta Pi.

JOHN A. WORD, B.S., 1930, University of California (Berkeley); Bell Telephone Laboratories, 1930—. Prior to World War II, Mr. Word worked on the design of toll terminal room equipment. During World War II, he worked on sonar, communications countermeasures, and microwave radio. At present, he supervises a group in the equipment design of short- and long-haul microwave radio systems. Member,

Tau Beta Pi, Eta Kappa Nu; associate member, Sigma Xi; senior member, IEEE; registered professional engineer in the State of New York.

AARON D. WYNER, B.S., 1960, Queens College; B.S.E.E., 1960, M.S., 1961, and Ph.D., 1963, Columbia University; Bell Telephone Laboratories, 1963—. Mr. Wyner has been doing research on various aspects of information theory. He spent the year 1969–1970 visiting the Department of Applied Mathematics, Weizmann Institute of Science, Rehovot, Israel and the Department of Electrical Engineering, the Technion, Haifa, Israel on a Guggenheim Foundation Fellowship. He has also been a full- and part-time faculty member at Columbia University and the Polytechnic Institute of Brooklyn. He has been Chairman of the Metropolitan New York Chapter of the IEEE Information Theory Group, and is presently a member of the National Administrative Committee. He is also Associate Editor for the Shannon Theory of the IEEE Transactions on Information Theory. Member IEEE, SIAM, AAAS, Tau Beta Pi, Eta Kappa Nu, Sigma Xi.