*formance Factors in Communication Systems* (Horizon House Microwave, Inc., 1968). In 1955 he served as Visiting Mackay Professor of Electrical Engineering at the University of California, and in 1962 he was Visiting Ford Professor of Electrical Engineering at the University of Wisconsin.

Mr. Mumford received the IEEE Morris E. Leeds Award in 1967 and an alumni citation from Willamette University in 1968. He has served on the technical program committees of the Institute's International Conventions and Microwave Symposia. He has served continuously on the AdCom of the MTT Society since its inception and has acted as Secretary, Vice-Chairman, and Editor of the TRANSACTIONS. He has been a member of the IEEE Groups on Circuit Theory, Electron Devices, and Antennas and Propagation. He served as the first Chairman of the Quantum Electronics Council. He became a Registered Professional Engineer in the State of New Jersey in 1950, and is listed in Engineers of Distinction 1970. He was a member of the URSI National Committee representing Commission I from 1966 to 1969, and is active on the U.S. Standards Institute Committee C-95 having to do with radio frequency radiation hazards, being a coauthor of Standard C-95.1. After retiring from the Bell Telephone Laboratories in 1970, he served a term on the Board of Directors of the Weinschel Engineering Company and did some consulting work with them. In 1971 he was appointed Adjunct Associate Professor of Environmental Medicine, part time, at the New York University Medical Center where his chief contributions are in the field of Microwave Biological effects and Radio Frequency Radiation Hazards. He is still active as an independent consultant and also is a member of the Electromagnetic Radiation Management Advisory Council of the Office of Telecommunications Policy in the Executive Office of the President of the U.S. He is listed in American Men of Science, Who's Who in Engineering, and Who's Who in America.

# The 1974 S-MTT National Lectureship

## LOW NOISE RECEPTION AND TECHNOLOGY

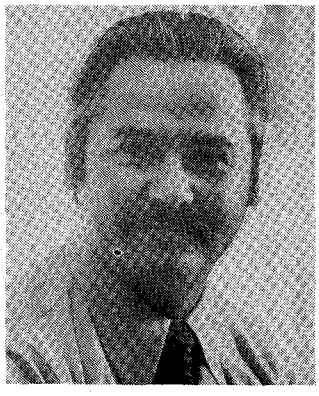
NOISE has always played a major role in the design of microwave systems. The tradeoff problems of transmitter power versus receiver sensitivity in radar, antenna size versus receiver sensitivity in communications, system noise temperature versus bandwidth and integration time in radiometry, etc., have always challenged the design engineer in the past and will continue to do so in the future. This lecture concerns itself with these tradeoff problems and presents several points of view relative to optimum performance.

The basic theme of the lecture concerns itself with the noise encountered in the reception process. Comparisons are given of all of the major low-noise receivers such as parametric amplifiers, upconverters, image-enhanced mixers, bipolar and FET transistor amplifiers, etc. In addition, a review of the basic concepts of noise and the methods of characterizing noise in different components and systems is presented.

For many years, teams of engineers were concerned with system design from the point of view of maximizing performance characteristics. It was, and in many cases still is, important to have a radar with a maximum of range and resolution, communication systems that have a maximum of channel capacity and data rates, and radiometers that can detect extremely small changes in background radiation. However, in today's climate, economics is becoming a continually growing parameter that enters the design concept. Many end users of systems are not specifying maximum performance but are stressing a given performance with a "design to cost" parameter. Therefore, a fresh approach must be used in configuring a system so that optimum use (from an economic and performance point of view) of all components and subsystems can be realized. This lecture also discusses microwave noise from the above economic point of view.

Detailed system descriptions of tradeoffs in radar, communications, and radiometry are given showing the compromises between transmitter power, receiver noise temperature, antenna diameter, etc. In addition, projections are made as to the performance that will be achieved in the future with continued advances in receiver technology.

SEYMOUR OKWIT



**Seymour Okwit** (A'55–M'60–SM'61–F'66) was born in New York, N. Y., on August 31, 1929. He received the B.S. degree from Brooklyn College, Brooklyn, N. Y., in 1952, and the M.S. degree in applied mathematics and the M.S. degree in physics from Adelphi College, Garden City, N. Y., in 1957 and 1961, respectively.

He is President of LNR Communications, Inc., Farmingdale, N. Y. He has published, as author or coauthor, over 40 papers and holds several patents for his work in the low-noise reception field. He has presented many of these papers at conferences and symposia and has been an Invited Lecturer at a number of IEEE lecture series particularly associated with solid-state and low-noise systems and components. He has also acted as Session Chairman at several conferences. From 1965 to 1968 he was Editor of the IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES. He has been an elected member of the G-MTT AdCom since 1966 and was the elected Chairman for 1971. He was an appointed member of the IEEE Publications Board, Chairman of the Finance Committee of the Publications Board, and a member of the IEEE Budget Advisory Committee.