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(*b*. Warsaw, Russian Poland, 19 March 1910; *d*. Tampa, Florida, 16 July 1981)

mathematical statistics, information theory.

Jacob Wolfowitz was born into a Jewish family, the son of Samuel and Chaya Wolfowitz. Samuel emigrated to the United States shortly before the outbreak of World War I, planning to have his family join him after a brief period. The outbreak of the war prevented this, and the family was not able to join Samuel in New York City until 1920. The war years were particularly difficult times for the family. Jacob Wolfowitz was educated in the public schools of Brooklyn, New York, and graduated from the College of the City of New York with the degree of bachelor of science in 1931. This was during the Great Depression, and Wolfowitz secured whatever employment he could, including high-school teaching, while continuing his education part-time. He obtained the M.A. degree from Columbia University in 1933, and the Ph.D. in mathematics from New York University in 1942. In 1934 he married Lillian Dundes. Their children, Laura Mary and Paul Dundes, were born in 1941 and 1943, respectively.

In 1942 Wolfowitz joined the Statistical Research Group of Columbia University, doing war-related research. In 1945 he became associate professor of statistics at the University of North Carolina. In 1946 he joined the newly formed Department of Mathematical Statistics at Columbia University. In 1951 he became professor of mathematics at Cornell University, and in 1970 he joined the Department of Mathematics at the University of Illinois. After retiring from Illinois in 1978, he became distinguished professor of mathematics at the University of South Florida, a position he held until his death. He also held visiting professorships at the universities of Paris, Heidelberg, and California at Los Angeles, and the Technion (Israel Institute of Technology).

His research accomplishments were recognized by a long list of honors, including an honorary doctorate from the Technion; election to the U.S. National Academy of Sciences and to the American Academy of Arts and Sciences; election as fellow of the International Statistics Institute, the Econometric Society, the American Statistical Association, and the Institute of Mathematical Statistics; a term as president of the Institute of Mathematical Statistics; and selection as Shannon Lecturer of the Institute of Electrical and Electronic Engineers and as the Wald and the Rietz lecturer of the Institute of Mathematical Statistics. He was an excellent lecturer, with a remarkable ability to clarify some very complicated mathematics, Wolfowitz was a physically vigorous man who played handball while he lived in New York City and took long, brisk walks when he moved away from the city. He was an omnivorous reader, with a remarkable knowledge of political, social, and economic conditions in all of the large countries and many of the small countries of the world. He was a lifelong and committed Zionist and was active in organizing protests against Soviet repression of dissidents, intellectuals, and minorities.

Wolfowitz met Abraham Wald soon after Wald arrived in New York City in the autumn of 1938. Wald was well known for his research on geometry and econometrics in Vienna, and the two men quickly became close friends and collaborators. Their earliest joint work was in the area of nonparametric statistical inference, their first paper appearing in 1939. Non-parametric Statistical inference is necessary when the statistician is unable to assume that he is sampling from a population whose form is known, and that the only unknowns are a finite number of parameters. The first appearance of the word “nonparametric” was in a 1942 paper by Wolfowitz. Wald and Wolfowitz constructed confidence bands for a completely unknown distribution function and constructed a test to determine whether two samples come from the same population, without making any assumptions about the form of the populations.

Another important subject on which Wald and Wolfowitz collaborated was sequential analysis. While working with the Columbia University Statistical Research Group, Wald had developed what he called the “sequential probability ratio test.” This test decides which of two populations is being sampled by taking observations one at a time and determining after each observation whether another observation should be taken or whether sampling should be terminated and a final choice made. The conventional technique was to take a predetermined number of observations. Wald conjectured that the sequential probability ratio test minimizes the average number of observations required, but no rigorous proof existed until Wald and Wolfowitz published one in 1948. This 1948 paper may have been the paper of which Wolfowitz was proudest. Wolfowitz published many other papers on sequential methods, including several that constructed estimators of unknown parameters using sequential sampling.

Wald died in 1950, and his death removed the strongest tie binding Wolfowitz to Columbia University. He moved to Cornell University in 1951. Jack Kiefer, who was just completing his doctorate at Columbia, moved to Cornell at the same time, and Wolfowitz and Kiefer started a long and fruitful collaboration. One important area they explored was the optimal design of experiments, which is the theory specifying where to take observations in order to estimate unknown parameters with the

smallest possible error. Kiefer and Wolfowitz also made important contributions to the mathematical theory describing the properties of queues. In collaboration with A. Dvoretzky they published fundamental research on the inventory problem, which is the problem of deciding how much inventory to hold in each of a sequence of intervals when there are penalties for holding too much or too little inventory and demand is random. This research was an early example of what came to be known as dynamic programming.

Starting in 1957 Wolfowitz devoted an increasing proportion of his research to information theory. Information theory describes how rapidly information can be sent over a channel when random errors occur in the transmission and the probability of correct decipherment must be at least equal to a preassigned value. Wolfowitz gave various limits on the rate at which information can be sent for various types of channels. His monograph *Coding Theorems of Information Theory* contains most of these results.

BIBLIOGRAPHY

Wolfowitz's research covered all of the major areas in mathematical statistics. *Jacob Wolfowitz: Selected Papers* (New York, 1980) contains a complete list of his 120 publications, the complete text of 49 papers he chose as among his most important, a brief biography, and a detailed discussion of his research. See also *Coding Theorems of Information Theory*, 3rd ed. (New York, 1978). An obituary by Rudolph Ahlswede, with bibliography, appeared in *IEEE Transactions on Information Theory*, **28** (1982), 687–690.

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