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JOSEPH LEO DOOB (1910–2004)

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Probability has been a subject of mathematical exploration for more than 300 years, but it was given a firm mathematical foundation much later by mathematicians such as Kolmogorov in Russia and Doob in America, beginning in the 1930s. Doob in his 1937 paper (but see Chapter 2 of his 1953 book *Stochastic Processes* for a more transparent treatment) gave the mathematical framework for the study of continuous parameter stochastic processes, that is, families of measurable functions indexed by a parameter such that the family is pointwise continuous in the parameter.

After the pioneering work of Lévy, Ville, and others, he began a wide-ranging development of martingale theory about 1940, the year of publication of his paper dealing with *processes of type E.* As David Blackwell observed, Doob's work did not catch on until he started to use the more exciting word *martingale* which had already been used much earlier by Bachelier in a more limited mathematical context. Martingale theory is the focus of one of the chapters, nearly 100 pages long, in his book *Stochastic Processes.* This treatise of over 650 pages has been one of the most important and influential books on probability since Laplace's 1812 book. Martingale theory plays an essential role in the study of Markov processes, mathematical statistics, information theory, financial mathematics, combinatorics, and many other parts of mathematics, science, and technology. The noncommutative version of martingale theory plays a significant role in mathematical physics.

In 1954, he showed how various classical potential theory concepts, such as the properties of the Perron-Wiener-Brelot solution of the first boundary value problem for harmonic functions on an arbitrary open set of an Euclidean space and arbitrary assigned boundary function correspond to properties of superharmonic functions on Brownian motion paths. He obtained similar results for the heat equation in 1955.

During the early part of his career, he made important contributions to complex function theory, ergodic theory, Markov process theory, martingale theory, boundary theory, and much else. He and his work became enormously influential. He retired from teaching at the age of 68. Although he claimed that he was also retiring from mathematics as well, he continued to be mathematically active. This included writing a number of papers and two books;

one of these, *Classical Potential Theory and Its Probabilistic Counterpart*, is over 800 pages long. A glimpse of his personality and mathematical style can be found in his vivid autobiographical remarks in response to the short but well posed questions of Laurie Snell contained in the November 1997 issue of *Statistical Science.*

He was born in Cincinnati, Ohio, February 27, 1910, the son of Leo Doob and Mollie Doerfler Doob. The family moved to New York City before he was three years old. The parents felt that he was "under-achieving" in grade school and placed him in the Ethical Culture School, from which he graduated in 1926. He then went on to Harvard where he received a BA in 1930, an MA in 1931, and a PhD in 1932. After postdoctoral research at Columbia, he joined the Department of Mathematics of the University of Illinois in 1935 and served until his retirement in 1978. He was a member of the Urbana campus's Center for Advanced Study from its beginning in 1959. During the Second World War, he worked in Washington, D.C., and Guam as a civilian consultant to the Navy.

He was married to Dr. Elsie Field for nearly sixty years. She died on January 24, 1991. She was the Medical Director of Planned Parenthood of Champaign County and worked as a full-time volunteer after her retirement. He is survived by two sons and one daughter: Stephen Doob of Merlin, Oregon; Peter Doob of Brentwood, California; Deborah Doob of Loganville, Wisconsin; and by four grandchildren.

Doob served the mathematical profession as President of the Institute of Mathematical Statistics in 1950, as President of the American Mathematical Society during 1963-1964, and in many other capacities. He was elected a member of the National Academy of Sciences in 1957, a member of the American Academy of the Arts and Sciences in 1965, and a foreign associate of the French Academy of Sciences in 1975. He was awarded the National Medal of Science in 1979. In 1984 he was given the Steele Prize for his outstanding career and "continuing profound influence" by the American Mathematical Society. He received many other honors including an honorary doctorate from the University of Illinois.

He enjoyed, no matter what the season or the weather, hiking and the camaraderie with other members of the Saturday Hikers, an informal group with nearly 100 years of existence. He also liked to canoe on the nearby Salt Fork, the Vermillion, and the Sangamon rivers, rivers immortalized in the poem "Memory of a Scholar" by Richmond Lattimore (highly praised for his translation of the Iliad and Odyssey).

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