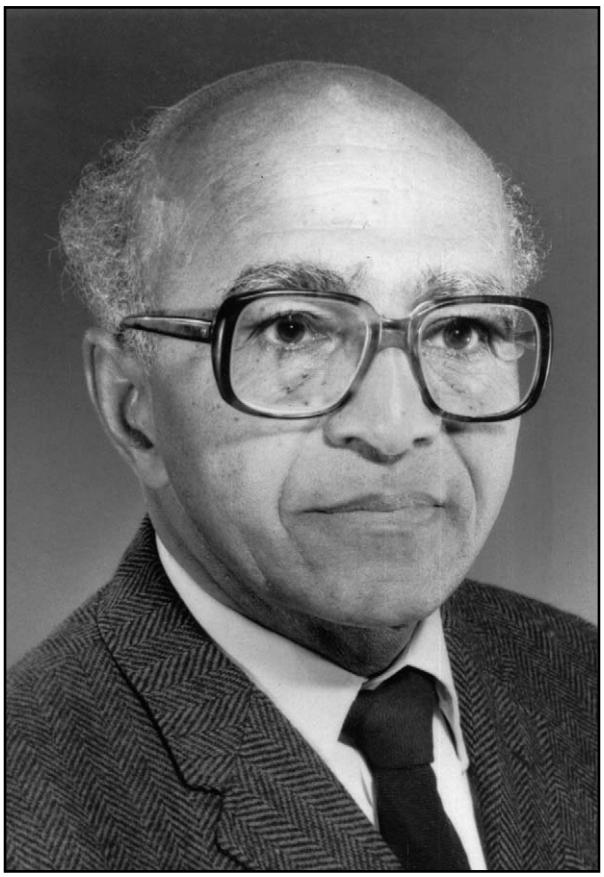
DAVID H. BLACKWELL



24 APRIL 1919 · 8 JULY 2010

DAVID HAROLD BLACKWELL, a scholar of mathematics and statistics, died of natural causes in Berkeley, California. He was a member of many communities and a role model for all.

David was born at home in the small southern Illinois town of Centralia. His parents had met there. His father, Grover, was a railroad hostler, that is, the person who takes the locomotive to the roundhouse at the end of a run. David enjoyed trains his whole life and remarked, "I still get a special feeling every time I see a picture of a steam locomotive." His mother, Ann, was born in Mississippi. Her family moved to Centralia, where her father founded a grocery store. David learned to read from seed packets in that store. He studied at integrated public schools, completing elementary education in six years, rather than the usual eight. He has described high school as "fabulous." In that period he prepared his first publication, a solution of a problem in a mathematics magazine. Of that time he remarked, "I really fell in love with mathematics."

David's college education was all at the University of Illinois, which he entered aged sixteen. In 1938, after three years of study, he obtained an A.B. degree. An A.M. followed in 1939, and then a Ph.D. in 1941. His thesis supervisor was Joseph L. Doob, and his thesis was titled "Properties of Markov Chains." Markov chains and processes became a lifelong interest of David's. Concerning his research results David would wonder, "What will Joe Doob think of this?" In 1966 David received a D.Sc. from that alma mater.

During the period 1941–42 David held a Rosenwald Fellowship at the Institute for Advanced Study in Princeton. He experienced discrimination in Princeton; in particular, he was not allowed into Fine Hall, the mathematics building on the university campus. Two people were not allowed to enter. One was a German and the other an African American—David.

In the summer of 1942 David became an assistant statistician with the Office of Price Administration in Washington, D.C. Then followed a year as instructor at Southern University in Baton Rouge. The next year he took a position as instructor at Clark College in Atlanta. David was introduced to his future wife, Ann, at Clark when he was about to teach a physics course and Ann came to register. In 1944 David went to a regular position at Howard University in D.C. Ann and he married shortly after his arrival there. He was head of the Howard mathematics department from 1947 to 1954.

In 1945 he began working on statistics problems following a lecture by M. A. Girshick. He has described Girshick as his mentor in statistics. In 1954 he left Howard for what would become a lasting position at

the University of California in Berkeley. In 1948–50 David spent summers at the Rand Corporation in Santa Monica. There he worked with and acknowledged the influence of K. Arrow, R. Bellman, A. Girshick, and J. Savage, amongst others. At Rand he co-authored some ten technical reports, mainly concerning military problems. There was also an article on poker strategy written with Bellman that was featured on the cover of *Scientific American*. He was a visiting professor of statistics at Stanford University during 1950–51.

The internationally renowned statistician Jerzy Neyman came to Berkeley in 1938. In 1944 he tried to have David appointed to the mathematics department; once again, however, David experienced disabling discrimination. The then department chair's wife objected strongly. She wished not to have to entertain David at her home. To his great regret Neyman dropped the idea. However, he tried again in 1955, when a statistics department was being formed, and this time succeeded. Blackwell joined a department made up of world-renowned figures. In particular the then professors were Blackwell, Lehmann, Loève, Neyman, and Scheffé. For many years Berkeley was considered to have the strongest statistics department in the world.

David had broad interests in pure and applied mathematics. In 1973 this led to his having an appointment also in mathematics. For the years 1973–75 David was away from Berkeley as director of the University of California Study Center for the United Kingdom and Ireland. Those years were productive both administratively and scientifically. His work became recognized internationally. In 1974 he was the W. W. Rouse Ball Lecturer and began with the remark "I had heard of Rouse Ball long before I had heard of Cambridge." (David had come across a book by Rouse Ball at high school.) Ever exploring, David returned to the United States via the Trans-Siberian Railway. On return he remained very active internationally; in 1973 he was president of the International Association for Statistics in the Physical Sciences, while for 1975 he was president of the Bernoulli Society. Also in the period 1975–77 he was vice president of the International Statistical Institute. He had become known in international circles. In 1981 David retired as professor emeritus at the then-obligatory age of retirement, seventy.

David received many awards and honors for his scientific contributions and service. In 1965 he was elected to the National Academy of Sciences, the first African American to be so honored. He received thirteen honorary doctorates, remarking that the ones from Howard and Illinois were the "most important . . . [They k]new me best." International honorary degrees came from Lesotho and Warwick. He was also elected to the American Academy of Arts and Sciences and made

an honourary fellow of the Royal Statistical Society. He was both Wald and Reitz Lecturer of the Institute of Mathematical Statistics. He won the R. A. Fisher Award of the Committee of Presidents of Statistical Societies and the von Neumann Theory Prize of the Operations Research Society of America.

An amazing number of lectures and concepts are named after David. These include the David Blackwell Lecture, the Blackwell-Tapia Award, Blackwell determinacy, Blackwell games, Blackwell's renewal theorem, Blackwell spaces, the Rao-Blackwell theorem, Blackwell optimal policies, Blackwell's theorem for G_d winning sets, Blackwell's approachability theorem, Blackwell's theory of combination of experiments, and the Blackwell channel.

David served as officer of, and on many committees of, professional societies. These included the American Association for the Advancement of Science, the American Mathematical Society, the American Statistical Association, the Bernoulli Society, the International Association for Statistics in the Physical Sciences, the International Congress of Mathematicians, the International Statistical Institute, the Institute of Mathematical Statistics, the Mathematical Association of America, and the National Research Council.

David Blackwell worked in and made original contributions to many areas. He wrote at least eighty-six scientific papers. A bibliography including eighty papers appears in the 1996 volume honoring him (Ferguson et al.). Of Blackwell's research Paul Halmos once remarked, "David is both a pure mathematician, who knows about some of the fanciest parts of what is known as descriptive set theory, and a statistician, who can use fancy set theory to get results that other statisticians regard as important." The citation for the 1979 John von Neumann Prize says, "[I]n a remarkable series of papers . . . [Blackwell] put the theory of dynamic programming on a rigorous mathematical footing, . . . Virtually all of the subsequent developments in this field are based on these fundamental papers."

David had an attitude towards research. He stated in a conversation with J. Albers that he was not interested in doing research and never had been. When asked what he was interested in, he said, "I am interested in understanding, which is quite a different thing."

Next, some of his specific publications are mentioned. His first paper was titled "Properties of Markov Chains," and appeared in *Annals of Mathematics* in 1942. What he called his "first statistical paper" and a favourite appeared in 1946 in *Annals of Mathematical Statistics*. It was called "On an Equation of Wald." "I like my [1949] paper with Ken Arrow and Abe Girshick, 'Bayes and Minimax Solutions of Sequential Decision Problems,'" he said, and remarked, "That was a serious paper,"

one that "was big and made important advances." There is also the 1967 *PNAS* paper, "Infinite Games and Analytic Sets." This paper is little more than a page in length. Of it Blackwell remarked, "[I]t gave me real joy, connecting these two fields that had not been previously connected." He also said, "That's one of my papers I like very much." Perhaps the most famous paper in the mainstream statistical world for many years has been "Conditional Expectation and Unbiased Sequential Estimation" (*Ann. Math. Stat.* 1947). It provided an independent discovery of the technique of Rao-Blackwellization.

In his papers and lectures David was a non-confrontational, enthusiastic Bayesian. David wrote two books, one with his mentor Abe Girshick, *Theory of Games and Statistical Decisions* (Blackwell and Girshick 1954), and the second, *Basic Statistics* (Blackwell 1969). Of the latter he remarked, "The approach is intuitive, informal, concrete, decision-theoretic, and Bayesian." The index of the 1954 book has many entries under the keyword Bayes. Further, he had a rallying cry: "And go, Bayes!" (He was an avid sports fan.)

David had sixty-five doctoral students. The ones that I know have done very well. Their thesis topics might be considered further research contributions of David Blackwell.

He lived through periods of segregation and discrimination and protests against these. In seeking his first academic job he wrote 105 letters of application, all to traditionally black colleges. He was in Berkeley during the disturbances over the Free Speech Movement (FSM), People's Park, Black Studies, and the Vietnam War, amongst others. At the time of the 1964 FSM he joined with other faculty members in a "public statement announcing their shock at the amassing of police on campus October 2." In the Black Studies protests of 1968 he joined in a "Statement of the Black Faculty and Administrators on the Current University Conflict." About Vietnam he remarked, "I was against the [Vietnam] war, but I would have taken the position that mathematics doesn't have much to do with it," and concerning the character of some protests he said, "I felt, and still feel, that Martin Luther King and Gandhi had the right idea."

David had a dignity. When I asked him once about a photo that I had come across of World War II "Black code breakers," his remark was "That's the way things were." He had an easy-comfortable way of dealing with people. A long-term African American staff member, Pat Hardy, remarked, "He treated everyone the same." This also refers to age. David received a stream of email and regular letters from young students asking him questions about his life. The impression is that he answered them all.

David passed away in Berkeley aged ninety-one. He was survived

by four of his eight children: Hugo of Berkeley, Ann Blackwell and Vera Gleason of Oakland, and Sarah Hunt of Houston. He was preceded in death by his wife, Ann Madison Blackwell, who died in 2006 after sixty-two years of marriage; and by his children Julia Madison Blackwell, David Harold Blackwell Jr., Grover Johnson Blackwell, and Ruth Blackwell Herch.

Elected 1990

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