

# Dr. David Harold Blackwell, African American Pioneer

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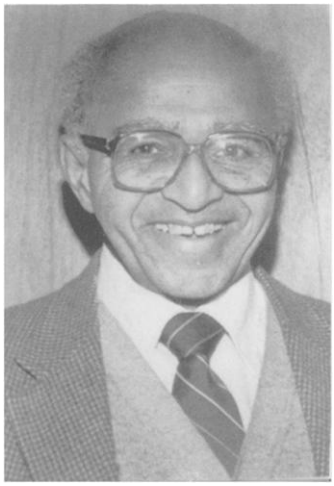

Dr. David Harold Blackwell 1919–
"Find something that you like.
It is more important than how much money you make." [**1**]

Dr. David Blackwell is an African American educational pioneer and eminent scholar in the fields of mathematics and statistics, whose contributions to our society extend beyond these fields. This paper highlights his significant contributions and the personal, educational, and professional experiences that groomed and nurtured him for leadership as a civic scientist. We hope this account of Dr. Blackwell's life will enhance the literature on African American achievers, and motivate students majoring in, or considering careers in mathematics and statistics, particularly those from underrepresented groups.

## The education of David Blackwell

**Early childhood** It is April 24, 1919, an era of heightened segregation and racial discrimination in the United States. Welcome to Centralia, Illinois, a small town community on the "Mason-Dixon line," with a population of about 12,000 people, and very few African American families [**13**]. Witness the birth of David Harold Blackwell. He was to be the eldest of four children born to Grover Blackwell, a hostler for Illinois Central Railroad and Mabel Johnson Blackwell, a full-time homemaker. His

two younger brothers, J. W. and Joseph, and his younger sister Elizabeth would follow soon after.

During his early childhood, David had a grandfather and an uncle living in Ohio who were influential to his cognitive development. His grandfather, whom he had never met, was a school teacher and later a storekeeper. He endowed David with a large library of books. From this library, David read and enjoyed many books, including his first algebra book. His uncle had been home schooled by his grandfather, because of worries about the effects of racism on his son at school. He impressed David with his ability to add three columns of numbers expeditiously, in a one-step process.

David attended Centralia public schools for the first ten years of his schooling, from 1925 to 1935. His parents enrolled him in integrated schools in his southern Illinois locality, which also had racially segregated schools: whites only schools and blacks only schools. However, being at an integrated school, David was unaware of, or unaffected by, issues of racial discrimination. He attributes this to the fact that his parents shielded their children as much as possible from the effects of racism, and to the fact that he experienced few encounters where race was an issue.

**High school education** In high school, David developed a strong interest in games such as checkers and in geometry, but was not particularly interested in algebra and trigonometry. He pondered over questions of whether the player with the first move in these games had a higher probability of winning. He states this about geometry:

> Until a year after I finished calculus, it was the only course I had that made me see that mathematics is really beautiful and full of ideas. I still remember the concept of a helping line. You have a proposition that looks quite mysterious. Someone draws a line and suddenly it becomes obvious. That's beautiful stuff. I remember the proposition that the exterior angle of a triangle is the sum of the remote angles. When you draw that helping line it is completely clear. [**3**, p. 20]

Fortunately for David, he had teachers who nurtured his mathematical interests. His geometry teacher got him to love mathematics by helping him to see the beauty of the subject. A teacher named Mr. Huck formed a mathematics club where he would challenge students with problems from the School Science and Mathematics journal. Whenever a student came up with a good possible solution Mr. Huck would send the solution to the journal under the student's name. David's solutions got published once in the journal and he was identified three times there as having correct solutions to problems, which gave him great joy. This was something that further motivated his interest in mathematics. Consequently, long before he was admitted to college, David had decided to major in mathematics. He states, "I really fell in love with mathematics.... It became clear that it was not simply a few things that I liked. The whole subject was just beautiful." [**3**, p. 21]

**Undergraduate education** David graduated from high school in 1935, at the age of 16. He promptly enrolled at the University of Illinois in Champaign-Urbana, a campus with no black faculty at that time. His intention was to earn a Bachelor's degree and become an elementary school teacher. This decision was motivated by the scarcity of jobs at that time and the fact that a good friend of his father, with a strong influence on the school board in a southern Illinois town, had promised to get him hired upon graduation. However, because his decision to become an elementary school teacher was based primarily on the need for employment after graduation rather than a keen interest, he kept postponing his education courses. After a time, they were no longer necessary, due to a change in his career decision.

David's career goal to become an elementary school teacher changed in his combination junior/senior year when he took a course in elementary analysis. This course really sparked his interest in advanced level mathematics. It motivated him to consider a career that would require graduate level education in mathematics. He now set his sights on teaching at the college or high school level. He began to pursue activities that would facilitate his career goals and groom him for leadership, such as serving as president for the mathematics club at this university. His parents, who were not college educated folks, left it to him to make the hard core decisions about his college education and career. However, they supported him in every way they could and encouraged him to work hard to achieve his goals.

At the end of his freshman year, David learned that his father was borrowing money to finance his college education. A young man with strength of character, he decided to spare his father this financial ordeal by taking responsibility for supporting his college education by working as a dishwasher, a waiter, and a cleaner for equipment in the college entomology lab. In spite of having to work his way through college, David facilitated his college education by taking summer classes and passing proficiency exams, which allowed him to skip courses. Thus, in 1938, he graduated with a Bachelor's degree in mathematics within three years of admission to college.

**Graduate education** David continued on for graduate study from 1938 to 1941, at Champaign-Urbana, working to pay for his education as usual. In his last two years of graduate study, while he was a doctoral student, he was awarded fellowships from the university. David has mixed feelings about the motivations of the university officials in offering him these fellowships. He says this about the issue:

> One of my fellow graduate students told me that I was going to get a fellowship. I said, "How do you know?" He said, "You're good enough to be supported, either with a fellowship or a teaching assistantship, and they're certainly not going to put you in the classroom." That was funny to me because fellowships were the highest awards; they gave one the same amount of money and one didn't have to work for it. I have no doubt, looking back on it now, that race did enter into it. [**3**, p. 21]

In 1939, David earned a master's degree in mathematics, proceeding on for doctoral studies with some trepidation. He was confident that he could handle the mathematics course work and read research papers. However, he was unsure about whether he would be successful in writing a thesis. Being a determined young man, he took on this challenge, bearing in mind that he had the option of high school teaching in the event that he was not successful in completing the doctoral program.

David's thesis advisor was Joseph Doob. He was a probability and statistics professor at Champaign-Urbana, renowned for his contributions to martingale theory. David states, "Joseph Doob had the most important mathematical influence on me. I studied his work carefully and learnt a lot from it. I admired him and tried to emulate him." [**1**] This statement captures the significance of documenting the contributions and biographies of pioneers, innovators, and leaders in any field of study.

Ironically, David had never met Doob prior to approaching him to become his thesis advisor. His decision to appeal to Doob was based on the recommendation of a peer mentor, Don Kibbey, a teaching assistant in whom he placed a great deal of confidence; Doob was Don Kibbey's dissertation advisor at that time. He was also the dissertation advisor to Paul Halmos, a mathematician who contributed immensely to the development of measure theory and who was a significant peer mentor to David in this area while they were both students of Doob.

In 1941, at the age of 22, within five years of graduation from high school, David earned a doctorate in mathematics. He is the seventh African American to earn a Ph.D. in this field. His dissertation is titled, "Some Properties of Markoff's Chains." It led to his first set of publications: "Idempotent Markoff Chains," "The Existence of Anormal Chains," and "Finite Non-homogeneous Chains." [**4, 5, 6**] David credits the main idea in his thesis to his advisor Joseph Doob. In doing so, he shows how important a thesis advisor is in helping students to identify appropriate research questions.

**Post-doctoral education** Upon completion of his doctoral program, David was awarded a Rosenwald Post-doctoral Fellowship for a year at the Institute of Advanced Study (IAS) at Princeton University. His exposure at the IAS was the beginning of a stellar career as a renowned mathematician, statistician, and educator.

His acceptance at the IAS was not devoid of the hurdles of racism. At that time, it was customary for Princeton to appoint IAS members as visiting fellows. However, when the administrators at Princeton, particularly the president, realized that David was a black man they profusely objected to his acceptance at the IAS. Princeton had never admitted a black student nor hired a black faculty member, and the administrators wanted to maintain the status quo. Upon the insistence and threats of the IAS director, the administrators of Princeton later withdrew their objections to David's acceptance at the IAS. At the time David accepted the Rosenwald Fellowship, he was unaware of the racial controversy that took place between the IAS director and the president of Princeton. He discovered the exact details several years later during the prime of his professional career. Thus, he was shielded from the marring effects of racism on his acceptance of the Rosenwald Fellowship and his stay at the IAS.

At the IAS, there were two mathematicians in particular who influenced David's post-doctoral education, Samuel Wilks and John von Neumann, a renowned Hungarian American mathematician credited with initiating the development of game theory. David developed a keen interest in statistics by auditing Samuel Wilks' course. Wilks was a mathematician renowned for his work in developing the field of mathematical statistics. He was a founding member of the Institute of Mathematical Statistics, an international professional and scholarly society devoted to the development, dissemination, and application of statistics and probability. (Much later, in 1955, David would serve as president of this organization.)

Another important mathematician who took an interest in David was John von Neumann. He encouraged David to meet with him to discuss his thesis. David avoided this meeting for several months because he did not think that the great John von Neumann was genuinely interested, or had the time to listen to him discuss his thesis. This turned out to be a flawed assumption, for von Neumann was indeed interested in mentoring students. When David and von Neumann finally met to discuss his thesis, von Neumann spent about 10 minutes listening to David's explanation about his thesis and asking him related questions. Afterwards, he took the liberty to explain to David other simpler techniques that he could have used for his thesis problem. The time David spent with von Neumann discussing his thesis, seeing firsthand that he was willing to mentor students, certainly impressed young David. Throughout his professional career, even at the height of success, we see him mentoring students and other young professionals.

## Professional career: scholar, teacher, and administrator

We only have to examine the humble beginnings of David's professional career to understand some of the negative consequences of racism, and other forms of discrimi-

nation, on society. David was a young African American pioneer with genius, integrity, and strength of character, whose work was of interest to world-class mathematicians of this period. Yet when he completed his post-doctoral education, the only universities he applied to for a faculty position were Historically Black Colleges and Universities (HBCUs), because he could envision himself nowhere else. He states:

> It never occurred to me to think about teaching in a major university since it wasn't in my horizon at all—I just assumed that I would get a job teaching in one of the black colleges. There were 105 black colleges at that time, and I wrote 105 letters of application.... I eventually got three offers, but accepted the first one I got. From Southern University. [**10**]

From 1942 to 1943, David was an instructor at Southern University in Baton Rouge, Louisiana. In 1943, he accepted an instructor position for a year, at another HBCU, Clark College, in Atlanta, Georgia. In 1944, at the end of his term at Clark College, David still envisioned himself as a faculty member at an HBCU. He accepted a tenure-track position as an assistant professor at Howard University, Washington D.C., the premier HBCU at that time, where he was one of the Mathematics Department's four faculty members. At Howard he was a generalist, teaching all mathematics courses right up to the master's degree level, which was the highest degree program in the department.

David stayed at Howard for ten years, from 1944 to 1954, rising through the ranks from Assistant Professor to Associate Professor in 1946, and finally to the position of Professor and Chairman of the Mathematics Department in 1947. In spite of the heavy teaching loads of at least 12 hours per week, and heavy administrative duties at these HBCUs, he had over 20 publications by the time he left Howard. He had also earned a strong reputation as an excellent teacher and innovative scholar in probability, statistics, and game theory.

Interestingly, although David enjoyed his work as a mathematics faculty member at Howard, it was not Howard but the larger mathematics community and professional networking that was the springboard for his professional success. He says, "I was teaching at Howard and the mathematics environment was not really very stimulating, so I had to look around beyond the university for whatever was going on in Washington that was interesting mathematically." [**10**] However, Howard should be given some credit. The administrators understood the importance of professional meetings and supported David financially and otherwise to allow him to attend them. This illustrates how important it is for students and young professionals to attend professional meetings and participate in professional organizations.

David credits Abe Girshick for initiating his professional success in statistics. He attended a meeting sponsored by the Washington Chapter of the American Statistical Association. There he listened to an interesting lecture by Girshick on sequential analysis. The lecture involved a discussion of Wald's equation, a concept David found to be unbelievable. Thus, after the meeting, David constructed a counterexample to this equation, which he mailed to Girshick. His counterexample turned out to be wrong. However, it resulted in an invitation from Girshick to David to meet with him in his office to discuss it. This meeting was the beginning of a wonderful relationship for both men and several years of collaboration, which culminated years later in a classic mathematics book, *Theory of Games and Statistical Decisions* [**9**]. It also resulted in several publications by David, including his favorites: "On an equation of Wald" [7] (a proof with much weaker constraints of the equation he found to be unbelievable) and "Bayes and minimax solutions of sequential decision problems." [**8**]

According to David, Abe Girshick was his most influential mentor in the field of statistics. He took time off to work in collaboration with Girshick at the RAND Corporation and Stanford University, California, while he was still a faculty member at Howard. The RAND Corporation began as Project RAND, started by the Air Force in 1946 to conduct long range studies in intercontinental warfare by means other than ground armies. David worked as a mathematician at the RAND Corporation in Santa Monica, California, from 1948 to 1950 during the summer periods, and as a Visiting Professor at Stanford, from 1950 to 1951. These were the most significant times for him. His work during this period resulted in breakthroughs that set the stage for world recognition.

David's work in game theory blossomed at the RAND Corporation while he was collaborating with Abe Girshick and other colleagues. World War II had promoted an interest in the theory of games depicting duels. The theory of duels deals with two-person, zero-sum games.

Imagine two persons initially standing $2n$ paces apart, each with a gun loaded with a single bullet. They are advancing towards each other. At every step forward each person has to decide whether to shoot or hold fire without any prior knowledge of what the other person's decision will be. A strategy certainly involves how many of the possible $n$ steps have been taken already, knowledge of one's own shooting ability, and some guess about one's opponent. Firing too soon means the shooter might miss; firing too late might mean the shooter may have been shot. To simplify the theory, we assume that the game always ends with one person having been shot.

David explored different variations on the basic theory of duels. For instance, if the intention is to kill one's opponent, then the optimal number of steps before firing may be different than it would be if all one wants is to stay alive. It also might make a difference if both guns have silencers, so one might not know that the opponent has fired and missed. His work in the theory of duelling led to significant developments in game theory and earned him a reputation as a pioneer in this area. He developed a game theoretic proof of the Kuratowski Reduction Theorem, which was groundbreaking in that it connected the fields of topology and game theory, an achievement that gives him great pleasure.

David did not explore beyond two-person, zero-sum games. He attributes his reluctance to do so to the extreme complexity of other types of games and to the fact that the best mathematical response for certain games may have a negative social, psychological, or economical response. This had to do with the *sure thing principle*, which was formulated by Jimmie Savage, one of David's mentors at the RAND Corporation. One way of stating it is this: Suppose you have to choose between two alternatives, A and B, and you think that the outcome depends on some unknown situation X or Y. If knowing that X was the case would lead you to choose A over B and if knowing that Y was the case would still lead you to choose A over B, then, even if you do not know whether X or Y was the case, you should still choose A over B. It was thought that the arms race arising from the Cold War showed the sure thing principle at work.

Suppose that the U.S. and the Soviet Union both operate on the sure thing principle. They have to choose between arming (alternative A) or disarming (alternative B) without knowing whether the other nation is going to arm (situation X) or disarm (situation Y). The sure thing principle indicates that the best mathematical strategy is for both nations to continue arming themselves in order to stay ahead or at par with the opposing nation. This leads to the depletion of valuable resources that each nation could have spent on other important areas of development. This is like the well-known prisoner's dilemma, because both nations are actually losing when they use the sure thing principle. The winning strategy would be for both nations to disarm, a situation that is unlikely to happen due to mistrust between the two nations who both fear

that the other will double-cross them if they cooperate. David says, "I started working on this particular game where the sure thing principle led to behavior that was not best. So, I stopped working on it." [1] Here we see David as a moral scientist.

David's work with the RAND Corporation led him to an avid study of the works of Thomas Bayes. By a stroke of fate, an economist at the RAND Corporation asked David's mathematical opinion on how to apportion the Air Force research budget over a period of five years between immediate developmental and long-range research. The appropriate proportion is dependent on the probability of a major war within the budget period. If this probability is high, then the budget emphasis will be on immediate developmental research, and if it is low, the emphasis will shift to long-range research.

David gave a mathematically correct but unhelpful answer. He indicated that, in this situation, we are dealing with a unique event and not a sequence of repeated events, so the probability of occurrence of a major war within the five-year period is either 0 or 1, and is unknown until the five-year period has elapsed. The economist remarked, in a manner that intrigued David, that this was a common answer of statisticians. It caused him to ponder the problem, and to discuss it with Jimmie Savage on his visit to the RAND Corporation several weeks later. His discussion with Savage left David with a completely new approach to statistical inference—the Bayesian approach.

The Bayesian approach to statistical inference considers probability as the right way to deal with all degrees of uncertainty, and not just the extremes of impossibility and certainty, where the probability is 0 or 1. As a basic example, consider this: Even though we cannot observe the same five-year period repeatedly and deduce the probability of a war, we still may be able to make inferences about this probability and base decisions on our estimates of it. In more sophisticated applications, statisticians develop utility functions based on underlying probability distributions; decision-makers attempt to maximize utility.

Since David developed an appreciation for the Bayesian approach, all his statistical works have incorporated it. Thus, he credits Jimmie Savage as the second most influential person in terms of his statistical thinking.

**The years at Berkeley** In 1954, David accepted a visiting position for one year at the University of California, Berkeley. In the following year, he accepted a position as a full Professor at this university, and remained there until his retirement in 1988. It is noteworthy to point out that in 1942, much to David's surprise at the time, he was interviewed for a faculty position at Berkeley. However, he was not surprised or disappointed when he was not offered the position. The reason given by the university for not hiring him was that they had decided to appoint a woman, due to the war and the draft. Nevertheless, destiny prevailed. David finally ended up at Berkeley 12 years later, during the period of civil rights gains. African Americans were now beginning to enjoy more career opportunities and better employment practices.

Shortly after David's arrival at Berkeley, the Mathematics Department there was divided to make its Statistics Laboratory, headed by Jerzy Neyman, into a separate department of its own. For four years, from 1957 to 1961, David was the chair of the Department of Statistics, succeeding Neyman, the person who had interviewed him in 1942 for a possible faculty position at Berkeley. Neyman turned out to be a good friend. He had a personal influence on David through his warmth, generosity, and integrity.

David enjoyed his stint as chair of the department, but he admits that he did not miss the responsibilities of that position. He sees the primary goal of administrative leadership as creating an environment where the workers are happy. He states, "When I was department chairman, I soon discovered that my job was not to do what was right but to make people happy." [3, p. 30] The success of his leadership at Berkeley

shows that it was a winning strategy to build coalitions in which people enjoy working together.

David also provided leadership at Berkeley in other administrative capacities. He was the Assistant Dean of the College of Letters and Science from 1964 to 1968 at a time of serious strife at the university. He was also the Director of the University of California Study Center for the United Kingdom and Ireland, from 1973 to 1975.

While at Berkeley, David continued his scholarly work on the mathematics of competition and cooperation. Interestingly, although he accomplished many innovations while still a faculty member at Howard, he did not gain world recognition until he was a faculty member at Berkeley. Also interesting is the fact that his scholarship was not motivated by doing research for its own sake, but by attempting to understand the problems that intrigued him.

**A caring teacher** Surprisingly, even at Berkeley while David was at the peak of his research productivity, he taught probability and statistics courses at all levels, from elementary to graduate courses. He states, "There is beauty in mathematics at all levels of sophistication and all levels of abstraction." [**3**, p. 26] This statement highlights a very important quality that characterizes talented teachers: They are able to convey the beauty of their subject regardless of the level of mastery of the students.

David is very modest about his ability as a teacher. He sees himself as a good teacher for certain students, but not necessarily for all of them; he recognizes that there are some styles of teaching where he may not excel. He states, "People have different learning styles, abstract, concrete, visual, hearing, spatial, and so on. So it is necessary for teachers to reflect these learning styles in their teaching if they would like their students to appreciate the beauty of what they are teaching." [**1**] Many students evidently found David caring and approachable, since he served as the dissertation advisor to at least 53 students at Berkeley, a very high number.

David is a dynamic scholar and teacher who feels most comfortable when he is around students or those willing to learn and share. He is ever willing to jump to the blackboard to illustrate examples. From his conversations with colleagues and others he has granted interviews, his excitement with mathematics surfaces when he begins to ponder its beauty, how he fell in love with geometry, or how much pleasure it gave him to be challenged by a difficult proof of a theorem.

## World recognition: the leader and civic scientist

David's world recognition as an eminent scholar, educator, and leader in our society is illustrated through his numerous awards, honors, and positions of leadership in professional organizations. His honorary Doctor of Science degrees alone illustrate his widespread recognition. He has received 12 honorary Doctor of Science degrees: from the University of Illinois in 1966; Michigan State University in 1969; Southern Illinois University in 1971; Carnegie-Mellon University in 1980; the National University of Lesotho in 1987; Amherst College and Harvard University in 1988; Howard University, Yale University, and the University of Warwick in 1990; Syracuse University in 1991; and the University of Southern California in 1992.

Equally amazing are his extensive leadership roles and honors in the profession, which speak to his dynamism as a civic scientist, a role in which David emerged full-fledged after he left Howard University. In 1954, he gave the invited address in probability at the International Congress of Mathematicians in Amsterdam. This address is credited with spurring Berkeley to offer him a visiting professorship. From 1959 to 1960, he was a visiting lecturer for the Mathematical Association of Amer-

ica in a program to enhance undergraduate mathematics education. In 1965, he was elected to the National Academy of Science. In 1968, he was elected to the American Academy of Arts and Sciences. By this time, David had published at least 60 books and papers.

From 1968 to 1971, David served as the vice president of the American Mathematical Society. From 1972 to 1973, he was chairman of the Faculty Research Lecture Committee. In 1973, he was president of the International Association for Statistics in the Physical Sciences. In 1974, he was the W. W. Rouse Ball Lecturer at the University of Cambridge in the United Kingdom. From 1975 to 1978, he was president of the Bernoulli Society for Mathematical Statistics and Probability. From 1975 to 1977, he was vice president of the International Statistical Institute. In 1976, he was elected Honorary Fellow of the Royal Statistical Society. In 1977, he gave the Wald Lecture for the Institute of Mathematical Statistics. In 1978, he was vice president of the American Statistical Association. Additionally, David has given the Rietz Lecture for this Institute of Mathematical Statistics and he has served on the Board of Directors of the American Association for the Advancement of Science.

In fact, the Wald and Rietz Lectures of the Institute of Mathematical Statistics were instrumental in establishing his reputation as an effective and charismatic lecturer. Noteworthy is the fact that David was among a select few chosen to be filmed by the American Mathematical Society and the Mathematical Association of America, lecturing on mathematical topics accessible to undergraduate students.

The year 1979 was a wonderful one for David. He was awarded the John von Neumann Theory Prize by TIMS/ORSA, which today has become INFORMS, the Institute for Operations Research and Management Sciences. This was a significant honor given that John von Neumann was one of his earliest professional mentors. The purpose of this prize is to recognize a scholar (or more than one, in cases of joint work) who has made fundamental contributions to theory in operations research and management sciences. Although recent work is not overlooked, the award is usually given for work that has stood the test of time. The criteria for the prize are broad, and include significance, innovation, depth, and scientific excellence. In addition to a cash award and medallion, the citation reads:

> The John von Neumann Theory Prize for 1979 is awarded to David Blackwell for his outstanding work in developing the theory of Markovian decision processes, and, more generally, for his many contributions in probability theory, mathematical statistics, and game theory that have strengthened the methodology of operations research and management sciences. In the area of Markovian decision processes Blackwell, in a remarkable series of papers published between 1961 and 1966, put the theory of dynamic programming on a rigorous mathematical footing. He introduced new techniques of analysis and established conditions for the existence of optimal and stationary optimal policies. Particularly noteworthy are his studies of the effect of varying the discount rate and his introduction of the important concepts of positive and negative dynamic programs. Virtually all of the subsequent developments in this field are based on these fundamental papers. In other areas, Blackwell's early work with Arrow and Girshick helped lay the foundations for sequential analysis, and his subsequent book with Girshick systematized the whole field of decision theory, to the great benefit of a generation of mathematical statisticians. The famous Rao-Blackwell theorem on statistical estimation led to a practical method for improving estimates, now known as "Rao-Blackwellization." An elegant and important form of the renewal theorem is due to Blackwell, as is a beautiful characterization of the information content of an experiment. In game theory, he initiated the study of duels (with

Girshick) and later made several deep contributions to our understanding of sequential games and the role of information therein. [12]

David, the trailblazer, did not relax after receiving the John von Neumann Theory Prize. He continued scaling the frontiers of twentieth century developments in mathematics and statistics as a leader. In 1986, he was awarded the R. A. Fisher Award from the Committee of Presidents of Statistical Societies. Upon his retirement in 1988, David received the Berkeley Citation. This is one of the highest honors given to a faculty member at Berkeley, for exemplary service to the university and outstanding achievement in one's field. David received this citation for his work in game theory, Bayesian inference, and information theory, for authoring the classic book, *Theory of Games and Statistical Decisions* [9], and for induction into the American Academy of Arts and Sciences and the National Academy of Sciences. By the time of his retirement, he had well over 90 books and papers published on dynamic programming, game theory, measure theory, probability theory, set theory, and mathematical statistics.

A tribute to David's immense contributions is the long list of lecture series and publications in his honor. The book, *Statistics, Probability and Game Theory, Papers in Honor of David Blackwell* [11], is a compilation of 26 papers edited by T. S. Ferguson, L. S. Shapley, and J. B. MacQueen. These papers treat topics related to his significant contributions in probability, statistics, gambling, game theory, Markov decision processes, set theory, and logic. The editors say this about the man honored by the volume: "It is the mark of an outstanding scientist to be influential in a variety of fields."

Another honor in this category is the Mathematical Sciences Research Institute (MSRI) conference and prize in honor of David Blackwell and Richard A. Tapia, distinguished mathematical scientists who have inspired more than a generation of African American and Hispanic American students and professionals in the mathematical sciences. The prize is awarded every second year to a mathematical scientist who has contributed significantly to his or her field of expertise, and who has served as a role model for mathematical scientists and students from underrepresented minority groups or contributed in significant ways to the addressing of the problem of the underrepresentation of minorities in mathematics.

Yet another honor in this category is the David Blackwell Lecture of the National Association of Mathematicians (NAM). This lecture is given annually at the MathFest, the popular summer meeting of the MAA. Its goal is to highlight the contributions of minorities in the mathematical community and to stimulate their professional growth.

## Family life and personal tidbits

On December 27, 1944, David married a wonderful woman by the name of Ann Madison. He says, "The best thing I ever did in life was to get married to my wife" [1]. Thus, it is poignantly clear that Ann played a very supportive role in her husband's successes, and in ensuring the stability and enhancement of their family.

David and Ann have eight children, three sons and five daughters, Ann, Julia, David, Ruth, Grover, Vera, Hugo, and Sara. Notably, none of their children have exhibited any interest in mathematics, nor in a related field, an issue that is viewed positively by David. In response to a question about his children, he says this: "No, they have no particular mathematical interests at all. And I'm rather glad of that. This may sound immodest, but they probably wouldn't be as good at it as I am. People would inevitably make comparisons." [1]

On David's off time, when he's not in a classroom filled with students, or writing fascinating papers on mathematical or statistical topics, or engaging in other profes-

sional commitments, you can find him with his wife on their 40 acre property in Northern California, listening to music and enjoying themselves. He might say his dream is to sit beneath a tree and sip a martini, but in reality he is more active, and finds himself planting trees or doing yard work. Many of his good friends are professional colleagues with whom he works and collaborates to advance the fields of mathematics and statistics.

There was a time when David's family home did not have telephone service. One of his children had made quite an expensive long distance telephone call, so David and his wife decided to have the telephone disconnected for a month. During that period, he realized the advantage of not having a telephone—peace and tranquility. One month led to three months, but eventually, the advantages of the telephone won over its cons.

David enjoys playing on the computer. However, these are not trivial games that he plays. He says, "I have a little computer at home, and it is a lot of fun just to play with. In fact I'd say that I play with this computer here in my office at least as much as I do serious work with it." **[10]** He admits to attempting to use his computer to set up a program to take the square root of a positive definite matrix, to minimize functions with five variables, and to look at curves. Perhaps this kind of play is at odds with the image of the mathematician who sits down to prove a theorem, but many of us enjoy this kind of fun.

## An example to remember

We learn a great deal from examples. If we know that someone has gone through a situation similar to ours, it helps us to analyze our situation in a more confident manner and to make better decisions. If we want students to make well-informed decisions concerning their educational and professional lives, we must provide them with examples of pioneers, innovators, and leaders, both in all fields of study and in all parts of our nation's history. The information about that successful person motivates students, and gives them the courage to tread similar paths. In the words of a student at Borough of Manhattan Community College (BMCC), City University of New York (CUNY), who was acquainted with Dr. David Harold Blackwell only through reading about him for a research project in an Introduction to Statistics class:

> David Blackwell's life has influenced me with the struggles that he has had to endure. He started out just wanting to teach elementary school, but his love of mathematics and his natural talent for mathematics has taken him so much further. This is an inspiration to me for I too love what I do and wish to go further. He has shown me to persevere in the face of adversity. I am happy to have learned so much about this truly incredible man. **[2]**

In addition, it is important to appreciate the contributions and accomplishments of persons from underrepresented groups in any field of study, in order to promote justice, equity, and diversity. This is an avenue for teaching cultural sensitivity and cooperation with people of different cultures, and a way to motivate students from these groups to similar or greater heights of success.

Dr. David Harold Blackwell is one of the world's most accomplished thinkers in the fields of mathematics and statistics. Of great significance is that he is one of the African American masters in these fields. He is a dynamic educator with a reputation as "one of the finest lecturers in the field." **[10]** He is a civic scientist and leader whose life history will certainly motivate others to follow his example. His example can also motivate us to develop the necessary mentoring programs and practices to open the

doors of opportunity for all students, especially for students from underrepresented groups, in the fields of mathematics and statistics.

By examining the conditions under which this mathematician rose to success, we can learn a lot about leadership, humility, strength of character, and passion for one's field. We can learn that mentoring, professional development, and active participation in professional meetings and organizations are vital opportunities. Providing them helps us to nurture students and encourage them to consider careers in mathematics and scientific fields and to groom young professionals in these disciplines. We can also learn about the social and psychological consequences of any form of discrimination on society.

Dr. David Harold Blackwell was not overly concerned about financial status when he decided to major in a career in mathematics. He had cultivated an appreciation for the subject and had a passion for examining and understanding issues that intrigued him. This passion led him to make groundbreaking innovations in the fields of mathematics and statistics. Our society has benefited from the vast contributions of this most renowned African American thinker. Unbelievable for a man that thought his story in life was to be an elementary teacher.

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