Video: "Remembering David Blackwell"

  Information Theory and Applications (ITA) 2011 Workshop at UCSD

Director/Producer Doug Ramsey

        Director of Communications, Callit2/San Diego Division

SCIENTIFIC
AMERICAN

January 1951

ISI, Dublin

August 2011

In Memoriam: David H. Blackwell

David R. Brillinger

UC Berkeley

David Blackwell, 'Superstar'

"*And, go Bayes!*"

Renowned as a researcher, renowned as a teacher, and renowned as a person.

Vital statistics

Homebirth April 24, 1919   Centralia, Illinois a small town.

Father, Grover Blackwell, railroad hostler

"I still get a special feeling every time I see a picture of a steam locomotive."

Integrated public schools, learned to read on own, completed elementary in 6 (vs. 8) years, high school "*fabulous*", first publication a problem solution in mathematics magazine

"I really fell in love with mathematics"

Goal: elementary school teaching

Higher education U of Illinois-Champaign, entered aged 16, after 3 years study A.M. in 1938, Ph.D in 1941 supervisor J. L. Doob "Properties of Markov Chains"

1941 Institute for Advanced Study, 2 people not allowed in Fine Hall, one German, other African American

1942 summer, assistant statistician Office of Price Administration

1942 Instructor Southern University Baton Rouge

1943 Instructor, Clark College, Atlanta

1944 Math Department Howard University

  1950-1954 Department Head

1954- Berkeley

Papers. First 8 out of 90 plus,

Idempotent Markov chains (1942) Ann. Math.

The existence of abnormal chains (1945) Bull. Amer. Math. Soc.

Finite non-homogeneous chains (1945) Ann. Math.

On an equation of Wald (1946) Ann. Math. Stat. "*favourite*"

On functions of sequences of independent chance vectors with with applications to the problem of the ... (1946) Ann. Math. Stat.

* Conditional expectation and unbiased sequential estimation (1947) Ann. Math. Stat.

A lower bound for the variance of some unbiased sequential estimates (1947). Ann. Math. Stat.

A renewal theorem (1948) Duke Math. J.

In early years, "*What will Joe Doob think of this?*"

RAND - Bellman, Girshick, Savage

A Bomber-Fighter Duel (II) - 1949

An Example of Bluffing with Pure Strategies - 1949

Application of Theory of Games to Identification of Friend and Foe - 1949

Comparison of reconnaissances - 1949

On a Particular Non-Zero-Sum Game - 1949

Some Two-Person Games Involving Bluffing - 1949

The Noisy Duel, One Bullet Each, Arbitrary Non-Monotone Accuracy - 1949

On Games Involving Bluffing - 1950

On the General Moment Problem. - 1950

The Prediction of Sequences . - 1955

RED DOG, BLACKJACK AND POKER

Three card games are considered in the context of a modern mathematical theory. Warning: the theory does not provide a blueprint for winning

by Richard Bellman and David Blackwell

EVERYONE knows that the best way to win at poker is to be lucky. Nevertheless, after a few disastrous sessions in which three kings encounter three aces head on, a straight yields ungracefully to a flush and a king-high bust loses to an ace-high bust, even an unanalytical player is apt to examine his conscience and meditate on his sins.

It is easy and relatively inexpensive to discover that it is exceedingly unprofitable to persist in drawing to inside straights, to raise on two pair against a one-card draw or to indulge in the optimism of drawing two cards to a flush.

bilities are more limited and which are therefore better suited to illustrate the fundamental concepts of the theory.

The coin-matching game is a good place to begin. Suppose that we are compelled, in all fairness, to match coins with our youngster on Sunday morning to determine who gets to read Li'l Abner first. It is clear that we may just as well toss our coin and let chance determine whether we show heads or tails. Let us, however, analyze this game in detail, for it indicates the procedure to be followed in more complicated games.

WE MUST first of all agree upon

ly and insist that A still toss his coin but allow B to choose heads or tails as he sees fit. Is it still a fair game? Interestingly enough the answer is "yes." We have here a manifestation of a very important, albeit paradoxical, quality of a large number of games; namely, player can inform his opp over-all strategy without slightest advantage. This proved mathematically for of games; the principle is Neumann's famous funda max theorem. In the g question, the application o clear enough; B gets no a
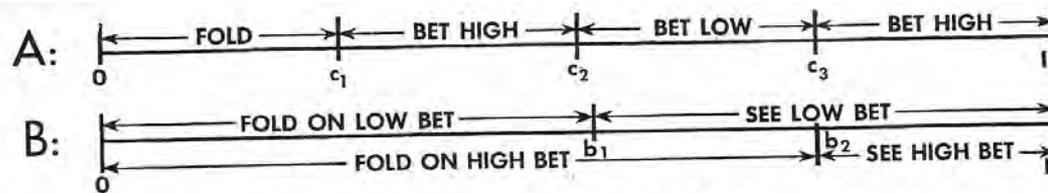
TACTICS of a simplified poker game are plotted by ranking hands in interval between 0 and 1. Player A can fold, bet low or bet high. Player B can fold or see. Intervals indicate hand values that dictate the player's choice.

mathematical argument that if we as- dealer must call all bets of the players,

Infinite games and analytic sets (1967) Proc. Nat. Acad. Sci. pp. 1 and 1/3 pages

"... *it gave me real joy, connecting these two fields that had not been preiously connected.*"

infinite games and analytic sets   game theory and topology

INFINITE GAMES AND ANALYTIC SETS*

By David Blackwell

UNIVERSITY OF CALIFORNIA, BERKELEY

Communicated September 21, 1967

We show in this note that Kuratowski's coreduction principle for analytic sets[1,3] is a consequence of a theorem of Gale and Stewart[2] on infinite games of perfect information.

A subset A of a complete separable metric space Y is *analytic* if there is a continuous function f from Ω to Y with $A = f\Omega$ where Ω is the space of infinite sequences of positive integers.

Kuratowski's coreduction principle asserts that

(1) *If A,B are analytic subsets of Y, there are analytic sets A_1,B_1 such that*

    (a) $A_1 \supset A, B_1 \supset B,$

    (b) $A_1 \cup B_1 = Y,$

    (c) $A_1 \cap B_1 = A \cap B.$

Blackwell (DHB) and Neyman (JN)

Mentors: Doob, Gershick, Neyman, Savage

1937 - JN visits U Illinois, DHB introduced

1944 - JN "I told Evans ... there is no doubt that the best candidate available would be David Blackwell."

JN contacts DHB about coming to Berkeley

Job offered to someone else   (still upset in video)

1944 - 1954 DHB at Howard U, DC

1954 - 1955 Visiting Prof UCB

1955 - 1973 Prof UCB

1973 - 1975 Director UC Study Center, UK and Ireland!

1981 - Emeritus

Blackwell saves the Department

pre 1955 Neyman creates Department

1955 Neyman resigns as Chair

   Cause? Aged 62, last opportunity for more major research?

UCB grants independent laboratory.

Budget about equal to Department's

   Competition, FRICTION

Many thought Department would fall apart

DHB to the rescue.

 Easy-comfortable way of dealing with people, in particular JN

       E. L. Lehmann (2008) "Reminiscences of a Statistician"

More trouble. Lehmann to the rescue

Space Committee (Blackwell, Hodges, Kiefer, DRB ex-officio)

"*Neyman Room*"

"*Neyman Professorships*"

Blackwell and students.

 Natural teacher

   grade school, high school, undergrad, grad, underrepresented minorities, whoever

Chair outside office

 Samagiego query re student's statement, "I didn't get that"

  DHB "*Well, I just repeat what I just said, only louder.*"

Blackwell and research

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.

Paul Halmos

Continuing elements: theory, markovs

Probability - a basic renewal theorm

Markov chains   Markov decision processes - positive and negative dynamic programs verying discount rates

Statistics - Rao-Blackwell, Bayesian,

Sequential analysis - Bayesian, optimality of prob ratio

Experiments - comparison

Game theory - timing, duels, vector-valued minimax, optimal strategies,definable infinite two prerson games, ...

Descriptive set theory - led to the understanding of long-standing puzzle

Logic - understanding ...alternating "for any" and "there exists" , regarded himself as a logician

Information theory - channels

Honours

First African American in National Academy of Sciences

13 honorary doctorates,

"*Most important ... Knew me best*", Howard U and U of Illinois

International, Lesotho and Warwick

American Academy of Arts and Sciences

R. A. Fisher Award

von Neumann Theory Prize, Operations Research Society of America

Honourary Fellow, Royal Statistical Society

Wald and Reitz Lecturer, IMS

Progeny

David Blackwell Lecture, MAA-NAM

Blackwell-Tapia Award

Blackwell determinacy

Blackwell games

Blackwell's renewal theorem

Blackwell spaces

Rao-Blackwell theorem

Blackwell optimal policies

Blackwell's theorem for G_δ winning sets

Blackwell's approachability theorem

Blackwell's theory of combination of experiments

Blackwell channel

Service to profession

Officerships and many committees:

   American Association for the Advancement of Science

   American Mathematical Society

   American Statistical Association

   International Congress of Mathematicians

   International Statistical Institute

   Institute of Mathematical Statistics

   Mathematical Association of America

   National Research Council

DHB and politics.

1964   FSM - DHB, Feldman, Helson, LeCam, Smale, Thomasian, Turin - 'public statement announcing their shock at the amassing of police on campus October 2'

1968, Black Studies - DHB et al. 'Statement of the Black Faculty and Administrators on the Current Unversity Conflict'

1972 McGovern delegate to Democratic convention

Blackwell, David Harold (b. 1919) — also known as **David Blackwell** — of Washington, D.C.; Berkeley, Alameda County, Calif. Born in Centralia, Marion County, Ill., April 24, 1919. Democrat. Served in the U.S. Navy during World War II; university professor; delegate to Democratic National Convention from California, 1972. African ancestry. Still living as of 1972.   (politicalgraveyard.com/bio/blackwell.html)

DHB. "*I was against the (Vietnam) war, but I would have taken the position that mathematics doesn't have much to do with it.*"

"*I felt, and still feel, that Martin Luther King and Gandhi had the right idea.*"

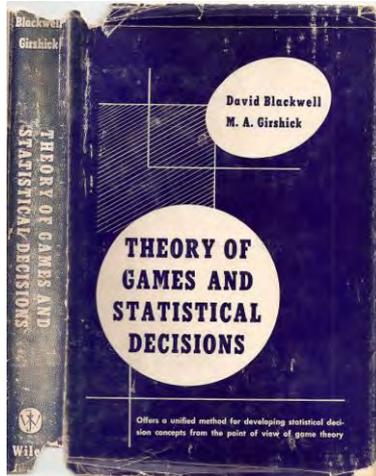"*Unions are sometimes good and sometimes not good.*"

Personal anecdotes
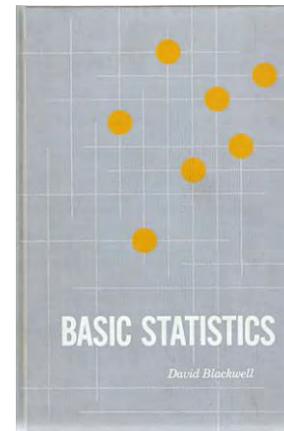
Elevator, Dennis Kucinich 1988

The California chariot.

My first statistics purchase, 1958

David, I'm surprised & pleased
(that you still have this book
David

BASIC STATISTICS

David Blackwell

BASIC STATISTICS
David Blackwell

AN ASYMPTOTIC REPRESENTATION OF THE SAMPLE DISTRIBUTION FUNCTION

BY DAVID R. BRILLINGER

Communicated by David Blackwell, January 10, 1969

1. Let $X_1, \cdots, X_n$ be independent observations from the uniform distribution on $[0, 1]$. Let $F_n(x) =$ the proportion of the $X_j \leq x$. We will prove

THEOREM. *There is a random function* $\{G_n(x); 0 \leq x \leq 1\}$*, with the same distribution as* $\{F_n(x); 0 \leq x \leq 1\}$ *for each n, and there is a Brownian motion W, such that for the Brownian* $B(x) = n^{-1/2}W(nx)$

$$\sup_{0 \leq x \leq 1} \; \left| n^{1/2}[G_n(x) - x] - [B(x) - xB(1)] \right|$$

(1)
$$= O[n^{-1/4}(\log n)^{1/2}(\log \log n)^{1/4}]$$

Proceedings of the International Congress of Mathematicians
August 16-24, 1983, Warszawa

DAVID R. BRILLINGER

Statistical Inference for Random Processes*

Blackwell and games/sports.

DHB.   "*I liked to play games. Checkers, chess, marbles ... basedball or softball.*"

 DHB. "*Organized track meets ourselves.*"

      U.S. Track and Field Championships, by train

Soccer game at Wembley

DHB. "*Are these guys any good?*"   Kjell Doksum

Soccer/world football penalty scoring (Haigh)

Data, percents

Goalie	Kicker		
	Left	Center	Right
Left	60	90	93
Center	100	30	100
Right	94	85	60

0-sum, min-max theorem   random strategy

goalie: (.44,.13,.34)   kicker: (.29,.34,.37)

leads to 80% of penalties scored if either used strategy

DHB.   "*They would know that.*"

Blackwell one-liners.

"Reagan likes strong trade unions - in Poland"

"If all else fails, read the manual"

"Always look for the simplest solution"

"It is OK to make misstakes, just don't do anything stupid"

"They didn't want anyone who knew anything on that jury."

In the end,

Pat Hardy - "He treated everyone the same."

Ann (Jay) Blackwell - wrote him once, "Thank you for making life fun and games"

Every blade in the fields

Every leaf in the forest

Lays down its life in its season

As beautifully as it was taken up

Henry David Thoreau

Passed away in Berkeley on July 8, 2010   aged 91

Family organized a "fun" memorial at International House

Survived by four of his eight children: Hugo of Berkeley; Ann Blackwell and Vera Gleason of Oakland; Sarah Hunt of Houston.

Preceded in death by his wife, Ann Madison Blackwell, who died in 2006 after 62 years of marriage; and by children Julia Madison Blackwell, David Harold Blackwell Jr., Grover Johnson Blackwell, Ruth Blackwell Herch

Sources.

Bancroft Oral history

C. Reid book

University of Illinois

Agwu, Smith, Barry *Mathematics Magazine*

Lehmann book

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