BRADLEY EFRON

Professor Emeritus of Statistics and of Biomedical Data Science

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University Address

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Born: May 24, 1938, St. Paul, Minnesota

Citizenship: U.S. Citizen

Education

1960	California Institute of Technology, B.S., Mathematics
1962	Stanford University, M.S., Statistics
1964	Stanford University, Ph.D., Statistics

Professional Experience

1964–1967	Assistant Professor, Department of Statistics, Stanford University, and Department of Community, Family and Preventive Medicine, Stanford School of Medicine
1967–1968	Visiting Lecturer, Department of Statistics, Harvard University
1968–1972	Associate Professor, Department of Statistics, Stanford University, and Department of Community, Family and Preventive Medicine, Stanford School of Medicine
1971–1972	Visiting Scholar, Department of Mathematics, Imperial College, London
1972–1988	Professor, Department of Community, Family and Preventive Medicine, Stanford School of Medicine
1972–	Professor, Department of Statistics, Stanford University
1980–	Co-director, Mathematical and Computational Science Program, Stanford University
1986–1987	Vice-Chairman, Stanford University Advisory Board
1987–1990	Associate Dean, School of Humanities and Sciences, Stanford University
1988–2021	Max H. Stein Professor of Humanities and Sciences, Stanford University
1988–2015	Professor, Department of Health Research and Policy, Stanford School of Medicine
1991, Apr–Jun	Visiting Professor, Department of Statistics, Harvard University
1976–1979, 1991–1994, 1993–1994, 1998–1999	Chairman, Department of Statistics, Stanford University
1996–1997	Chairman, Stanford University Advisory Board
1998–1999	Chairman, Stanford University Faculty Senate
1962–	Consultant, Rand Corporation, Santa Monica, CA
2008–2010	Consultant, Roche Palo Alto LLC, Palo Alto, CA
2012	Consultant, Google Analytics Group, Mountain View, CA
2015–	Professor, Department of Biomedical Data Science, Stanford School of Medicine

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Professional Activities

1968–1969	Associate Editor, *Journal of the American Statistical Association*
1969–1972	Theory and Methods Editor, *Journal of the American Statistical Association*
1969–1972	Fellow of the University, Stanford University
1976–1979	Executive Committee, Assembly of Mathematical and Physical Sciences
1985	Chairman, External Advisory Committee on Statistics for University of Maryland
1985–1986	Chairman, Overseers Committee, Department of Statistics, Harvard University

1984, 1985–1988	Member of the Committee on Resources for the Mathematical Sciences
1987–1988	President, Institute of Mathematical Statistics
1992–1998	Member, Advisory Board, Stanford University
1993–1999	Elector, Chair in Statistics, Cambridge University
1998	Member, Review Committee, Department of Statistics, University of Washington
2004	President, American Statistical Association
2006–2012	Founding Editor, *Annals of Applied Statistics*

Memberships

Fellow, Royal Statistical Society
Fellow, American Statistical Association
Member, National Academy of Sciences
Fellow, American Academy of Arts and Sciences
Fellow, Institute of Mathematical Statistics
Fellow, International Statistical Institute

Honors and Awards

1977	Rietz Lecturer, Annual Meeting of the Institute of Mathematical Statistics
1978	Lester R. Ford Award for Outstanding Expository Writing, Mathematical Association of America
1981	Wald Lecturer, Annual Meeting of the Institute of Mathematical Statistics
1981	"Outstanding Statistician of The Year", American Statistical Association Chicago Chapter
1983	MacArthur Prize Fellow
1983	American Academy of Arts and Sciences Fellow
1985	National Academy of Sciences Fellow
1987	Endowed Chair, Max H. Stein Professor of Statistics and Biostatistics
1990	Wilks Medal, American Statistical Association
1995	Honorary Doctor of Science Degree, University of Chicago
1996	Ronald A. Fisher Prize, Committee of Presidents of Statistical Societies (COPSS)
1998	Doctor Honoris Causa, Universidad Carlos III de Madrid, Spain
1998	Parzen Prize for Statistical Innovation, Texas A&M University
2002	Doctor Honoris Causa, University of Oslo, Norway
2003	C.R. and Bhargarvi Rao Prize, The Pennsylvania State University
2006	Gottfried E. Noether Prize, American Statistical Association
2005	National Medal of Science (awarded 2007)
2010	Distinguished Alumni Award, California Institute of Technology
2014	Guy Medal in Gold, Royal Statistical Society
2016	Frontiers of Knowledge Award, BBVA Foundation & Spanish National Research Council
2018	International Prize in Statistics, International Prize in Statistics Foundation

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Special Lectures

08.1966	Special Invited Lecturer, Annual Meeting of the IMS
1972	Lecturer on General Methodology, Joint Annual Meeting of the IMS and ASA
04.1976	Allan Craig Lecturer on Statistics, University of Iowa, Iowa City
05.1976	Special Lecturer in Statistics, University of Michigan, Ann Arbor
10.1978	Commonwealth Scientific and Industrial Research Organisation (CSIRO) Lecture Series, Clayton South, Victoria, Australia
05.1980	Special Lecturer, Massachusetts Institute of Technology, Cambridge
06.1980	Principal Lecturer, National Science Foundation Research Conference, Bowling Green, Kentucky
03.1981	Keynote Speaker, 13th Conference on the Interface Between Computers and Statistics
05.1981	Principal Lecturer, Annual Meeting of Canadian Statistical Association
07.1981	Special Lecturer, South African Statistical Association
1982	Zyskind Lecturer, Iowa State University, Ames
07.1982	Special Invited Lecturer, University of Waterloo, Ontario

09.1982 Special Invited Lecturer, European Conference of Statistics, Palermo, Italy
10.1982 Keynote Speaker, 28th Conference on the Design of Experiments in Army Research Development and Testing, Monterey, California
01.1983 Special Invited Lecturer, American Mathematical Society Annual Meeting, Denver
06.1983 Invited Lecturer, Psychometric Society Annual Meeting, University of California, Los Angeles
10.1983 Keynote Speaker, Associated Colleges of the Midwest Conference on Computers and the Liberal Arts, Madison, Wisconsin
04.1984 Invited Lecturer, Research Workshop on Differential Geometry in Statistics, Imperial College, London
07.1984 Keynote Speaker, Conference on Jackknife and Bootstrap Techniques, Edinburgh
10.1984 Distinguished Lecturer for the Lecture Series at University of Florida, Gainesville
02.1985 Division Speaker, Reed College, Portland, Oregon
02.1985 Special Lecturer, Mathematics Association of America
04.1985 Special Lecturer, Recent Advances in Mathematics and Statistics, University of New Mexico, Albuquerque
05.1985 Special Invited Lecturer for Short Course on Bootstrapping, Norwegian Statistical Association, Oslo
08.1985 ASA Short Course on Bootstrap–Jackknife Methods with Robert Tibshirani, Joint Statistical Meetings, Las Vegas, Nevada
04.1986 Main Invited Lecturer for Gesellschaft fur Angewandte Mathematik und Mechanik (GAMM) Annual Meeting, Dortmund, Germany
04.1987 Ferber Lecturer, University of Illinois, Chicago
01.1988 Public Lecture as Walker–Ames Professor of Biostatistics and of Statistics, University of Washington, Seattle
04.1988 Invited Lecturer, Annual Meeting of the Spanish Statistical Association, Benidorm, Spain
04.1988 Keynote Speaker, 20th Interface Symposium on Computing Science and Statistics, Reston, Virginia
08.1988 Keynote Speaker, COMPSTAT 88, Copenhagen
03.1989 Fulkerson Lecturer, Cornell University, New York
10.1989 Hotelling Lecturer, University of North Carolina, Chapel Hill
02.1990 Keynote Speaker, Symposium on Bootstrapping Methods for Statistical Analysis, Wayne State University, Detroit, Michigan
04.1990 Hartley Lecturer, Texas A&M University, College Station
07.1990 Keynote Speaker, 10th Australian Statistical Conference, University of New South Wales, Sydney
09.1990 Keynote Speaker, 4th Latin American Congress of Probability and Mathematical Statistics (CLAPEM), Mexico City
11.1990 Keynote Lecturer, Workshop on The Jackknife, the Bootstrap and Other Resampling Plans, CSI-Piemonte, Torino, Italy
03.1991 Pierre Robillard Lecturer, Montreal
05.1991 Royal Statistical Reading at Bath, and Invited Lecturer at Oxford University, England
03.1992 Charles L. Odoroff Memorial Lecturer, University of Rochester Medical Center, Rochester, New York
03.1993 Gentry Lecturer, Wake Forest University, Winston-Salem, North Carolina
09.1993 Special Lecturer, University of Padua, Italy
10.1993 Spiegelman Award Lecturer, American Public Health Association Meetings, San Francisco
05.1994 Invited Special Lecturer, Canadian Statistical Society Annual Meeting, Banff, Alberta
09.1994 Invited Plenary Lecturer, Royal Statistical Society Conference, Newcastle, England
11.1994 P.R. Krishnaiah Visiting Scholar and Keynote Speaker, Pennsylvania State, University Park
06.1995 Special Lecture Speaker, Third Great Lakes Symposium on Statistical Issues in Health Care and Medicine, Kalamazoo, Michigan
09.1995 Keynote Speaker, Statistical Symposium on Bootstrap Discrimination and Regression, Paris
06.1996 Keynote Speaker, Symposium on Statistics and Astronomy, Pennsylvania State, University Park
06.1996 Featured Speaker, Centers for Disease Control, Atlanta
06.1996 Bernard G. Greenberg Distinguished Lecturer, University of North Carolina, Chapel Hill
08.1996 Distinguished Fisher Lecturer, ASA Annual Meetings, Chicago, Illinois
04.1997 Robert Hogg Lecturer, University of Georgia, Athens
09.1997 DeGroot Lecturer, Carnegie Mellon University, Pittsburgh, Pennsylvania
12.1997 Honorable Visitor, Taiwan National Science Council
03.1999 Featured Speaker, 3rd Annual Howard Rowlee Lecture in Mathematics, University of Nebraska, Lincoln
04.1999 Featured Speaker, 5th Annual COSM Lecture, University of South Carolina, Columbia
10.1999 Buehler–Martin Lecturer, University of Minnesota, Twin Cities
12.1999 Clark Cockerham Lecturer, North Carolina State, Raleigh

07.2000 Keynote Lecturer, International Classification Society, Namur, Belgium
09.2000 Fisher Lecturer, Royal Statistical Society Annual Meeting, University of Reading, England
10.2000 Keynote Lecturer, Splus User's Conference, Seattle, Washington
04.2001 Lukacs Lecturer, Bowling Green University, Kentucky
10.2001 Keynote Lecturer, Austrian Statistical Society 50th Anniversary Meetings, Vienna
09.2003 Keynote Lecturer, SLAC Phystat2003, Stanford University, Palo Alto
06.2004 Keynote Speaker, International Chinese Statistical Association Applied Statistics Symposium, San Diego
10.2004 Keynote Lecturer, XII Annual Congress of the Portuguese Statistical Society, Évora
03.2005 Keynote Lecturer, ENAR National Conference, Austin, Texas
11.2005 Distinguished Lecturer in Statistical Science, Fields Institute, Toronto, Ontario
03.2006 Myra Samuels Lecturer, Purdue University, West Lafayette, Indiana
08.2006 Noether Lecturer, Joint Statistical Meetings, Seattle, Washington
01.2007 MAA Invited Address, Joint Mathematics Meetings of American Mathematical Society and Mathematics Association of America, New Orleans
10.2007 Discovery Series Lecturer, Vanderbilt Medical Center, Nashville
07.2008 Special Lecturer, American College of Radiology, Sonoma
10.2008 Laurence H. Baker Lectures, Fall Conference on Statistics in Biology, Iowa State University, Ames
04.2009 Keynote Speaker, Michigan Student Symposium for Interdisciplinary Statistical Science, University of Michigan, Ann Arbor
04.2009 Inaugural Shumway Lecturer, Statistical Science Symposium, University of California, Davis
04.2010 Distinguished Lecturer, H. Milton Stewart School of Industrial and Systems Engineering, Georgia Institute of Technology, Atlanta
07.2011 Inaugural Tsinghua University Pao-Lu Hsu Distinguished Lecture, Beijing
01.2012 AMS Josiah Willard Gibbs Lecturer, Joint Mathematics Meetings, Boston
10.2012 Center for Applied Mathematical Sciences Distinguished Lecturer, University of Southern California
04.2013 Wilks Memorial Lecture, Princeton University
11.2013 Department of Biostatistics & Bioinformatics Distinguished Lecturer, Duke University School of Medicine
01.2014 Department of Statistics Invited Lecturer, Texas A&M University
02.2014 Inaugural Bill Schucany Scholar Lecture Series, Southern Methodist University
03.2014 Department of Statistics Colloquium, Harvard University
08.2014 JASA Theory and Methods Session Lecturer, Joint Statistical Meetings, Boston
05.2015 Carl Morris Retirement Colloquium Main Speaker, Department of Statistics, Harvard University
10.2015 Biostatistics Seminar, University of Michigan School of Public Health, Ann Arbor
04.2016 Keynote Speaker, Workshop on Fusion Learning, BFF Inferences and Statistical Foundations, Rutgers University
07.2017 Introductory Overview Lecture: *Computer Age Statistical Inference*, Invited Special Presentation, Joint Statistical Meetings, Baltimore
06.2018 Keynote Speaker, International Chinese Statistical Association Applied Statistics Symposium, New Brunswick, New Jersey
08.2019 Plenary Speaker, 62nd ISI World Statistics Congress, Kuala Lumpur

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Abstracts

A1. Gaussian distributions for random lines, planes, and hyperplanes (1966). Delivered to the Western Regional Meeting of IMS, June 1965. Abstract appeared *Ann. Math. Stat.*, 769.

A2. The problem of the two nearest neighbors (1967). Abstract appeared *Ann. Math. Stat.*, 298.

A3. Power approximations in multivariate exponential families (with D. Truax) (1967). Delivered to Western Regional Meeting of IMS, June 1967. Abstract appeared *Ann. Math. Stat.*, 1595.

Publications

1. Optimum evasion versus systematic search (1964). *SIAM J.* **12**, 450–457.
2. Increasing properties of Polya frequency functions (1965). *Ann. Math. Stat.* **36**, 272–279.

3. Note on the paper "Decision procedures for finite decision problems under complete ignorance" (1965). *Ann. Math. Stat.* **36**, 691–697.
4. The convex hull of a random set of points (1965). *Biometrika* **52**, 331–343.
5. The two-sample problem with censored data (1966). *Proc. Fifth Berkeley Symp. on Math. Stat. and Prob.*, University of California Press.
6. Geometrical probability and random points on a hypersphere (with T. Cover) (1967). *Ann. Math. Stat.* **38**, 213–220.
7. The power of the likelihood ratio test (1967). *Ann. Math. Stat.* **38**, 802–806.
8. Large deviations theory in exponential families (with D. Truax) (1968). *Ann. Math. Stat.* **39**, 1402–1424.
9. Student's t-test under symmetry conditions (1969). *J. Amer. Statist. Assoc.* **64**, 1278–1302.
10. Hotelling's T^2 test under symmetry conditions (with M.L. Eaton) (1970). *J. Amer. Statist. Assoc.* **65**, 702–711.
11. Some remarks on the inference and decision models of statistics (1970). *Ann. Math. Stat.* **41**, 1034–1058.
12. Studies on toxoplasmosis in El Salvador: Prevalence and incidence of toxoplasmosis as measured by the Sabin–Feldman dye test (1970). J.S. Remington, B. Efron, E. Cavanaugh, et al. *Trans. Roy. Soc. Trop. Med. Hyg.* **64**, 252–267.
13. Does an observed sequence of numbers follow a simple rule? (Another look at Bode's law) (1971). *J. Amer. Statist. Assoc.* **66**, 552–559.
14. Spurious appearance of mosaicism in three generations in one family with a $3/B$ translocation. II: Statistical model of the chromosomal abnormality (with R.G. Miller, Jr. and B.Wm. Brown, Jr.) (1971). Department of Statistics Technical Report 27, Stanford University.
15. Forcing a sequential experiment to be balanced (1971). *Biometrika* **58**, 403–417. Also appeared *International Symposium on Hodgkin's Disease*, NCI Monograph **36**, 571–572.
16. Limiting the risk of Bayes and empirical Bayes estimators, Part I: The Bayes case (with C. Morris) (1971). *J. Amer. Statist. Assoc.* **66**, 807–815.
17. Limiting the risk of Bayes and empirical Bayes estimators, Part II: The empirical Bayes case (with C. Morris) (1972). *J. Amer. Statist. Assoc.* **67**, 130–139.
18. Empirical Bayes on vector observations: An extension of Stein's method (with C. Morris) (1972). *Biometrika* **59**, 335–347.
19. Improving the usual estimator of a normal covariance matrix (with C. Stein and C. Morris) (1972). Department of Statistics Technical Report 37, Stanford University.
20. Stein's estimation rule and its competitors – An empirical Bayes approach (with C. Morris) (1973). *J. Amer. Statist. Assoc.* **68**, 117–130.
21. Combining possibly related estimation problems (with C. Morris) (1973). With discussion. *J. Roy. Statist. Soc. Ser. B* **35**, 379–421.
22. Defining the curvature of a statistical problem (with applications to second order efficiency) (1975). *Ann. Stat.* **3**, 1189–1242 with discussion and Reply.
23. Data analysis using Stein's estimator and its generalizations (with C. Morris) (1975). *J. Amer. Statist. Assoc.* **70**, 311–319.
24. The efficiency of logistic regression compared to normal discriminant analysis (1975). *J. Amer. Statist. Assoc.* **70**, 892–898.
25. The possible prognostic usefulness of assessing serum proteins and cholesterol in malignancy (with F. Chao and P. Wolf) (1975). *Cancer* **35**, 1223–1229.
26. Biased versus unbiased estimation (1975). *Advan. Math.* **16** 259–277. Reprinted in *Surveys in Applied Mathematics* (1976). Academic Press, New York.
27. Families of minimax estimators of the mean of a multivariate normal distribution (with C. Morris) (1976). *Ann. Stat.* **4**, 11–21.

28. Multivariate empirical Bayes and estimation of covariance matrices (with C. Morris) (1976). *Ann. Stat.* **4**, 22–32.
29. Dealing with many problems simultaneously (with C. Antoniak) (1976). *On the History of Statistics and Probability* (D. Owen, ed.). Marcel Dekker, New York.
30. Estimating the number of unseen species: How many words did Shakespeare know? (with R. Thisted) (1976). *Biometrika* **63**, 435–447.
31. The efficiency of Cox's likelihood function for censored data (1977). *J. Amer. Statist. Assoc.* **72**, 557–565.
32. Stein's paradox in statistics (with C. Morris) (1977). *Scientific American* **236**, 119–127.
33. The geometry of exponential families (1978). *Ann. Stat.* **6**, 362–376.
34. Regression and ANOVA with zero–one data: Measures of residual variation (1978). *J. Amer. Statist. Assoc.* **73**, 113–121.
35. Controversies in the foundations of statistics (1978). *Amer. Math. Mon.* **85**, 231–246.
36. How broad is the class of normal scale mixtures? (with R. Olshen) (1978). *Ann. Stat.* **6**, 1159–1164.
37. Assessing the accuracy of the MLE: Observed versus expected Fisher information (with D.V. Hinkley) (1978). With comments and a reply by the authors. *Biometrika* **65**, 457–487.
38. Bootstrap methods: Another look at the jackknife (1979). *Ann. Stat.* **7**, 1–26.
39. Computers and the theory of statistics: Thinking the unthinkable (1979). *SIAM Review* **21**, 460–480.
40. A distance theorem for exponential families (1980). *Polish J. Prob. Math. Stat.* **1**, 95–98.
41. *Biostatistics Casebook* (with R.G. Miller, Jr., B.Wm. Brown, Jr. and L. Moses) (1980). John Wiley and Sons, New York.
42. Randomizing and balancing a complicated sequential experiment (1980). *Biostatistics Casebook, Part I*, 19–30. John Wiley and Sons, New York.
43. Which of two measurements is better? (1980). *Biostatistics Casebook, Part II*, 153–170. John Wiley and Sons, New York.
44. The jackknife estimate of variance (with C. Stein) (1981). *Ann. Stat.* **9**, 586–596.
45. Censored data and the bootstrap (1981). *J. Amer. Statist. Assoc.* **76**, 312–319.
46. Nonparametric estimates of standard error: The jackknife, the bootstrap, and other methods (1981). *Biometrika* **68**, 589–599.
47. Nonparametric standard errors and confidence intervals (1981). With discussion and a reply by the author. *Canadian J. Stat.* **9**, 139–172.
48. Computer and statistical theory (with G. Gong) (1981). Keynote address, *Proc. 13th Conf. on the Interface between Computers and Statistics*.
49. *The Jackknife, the Bootstrap, and Other Resampling Plans* (1982). Society for Industrial Mathematics, Philadelphia, PA.
50. Transformation theory: How normal is a family of distributions? (1982). *Ann. Stat.* **10**, 323–339.
51. Maximum likelihood and decision theory (1982). *Ann. Stat.* **10**, 340–356.
52. A leisurely look at the bootstrap, the jackknife, and cross validation (with G. Gong) (1983). *Amer. Statist.* **37**, 36–48.
53. Estimating the error rate of a prediction rule: Improvement on cross-validation (1983). *J. Amer. Statist. Assoc.* **78**, 316–331.
54. Computer intensive methods in statistics (1983). *Lisboa 200th Anniversary Volume*, Lisbon Academy of Sciences, 173–181.
55. Computer intensive methods in statistics (with P. Diaconis) (1983). *Scientific American* **248**, 116–130.
56. Comparing non-nested linear models (1984). *J. Amer. Statist. Assoc.* **79**, 791–803.
57. The art of learning from experience (with Gina Kolata) (1984). *SCIENCE* **225**, 156–158.

58. Testing for independence in a two-way table: New interpretations of the chi-square statistic (with P. Diaconis) (1985). With discussion and a rejoinder by the authors. *Ann. Stat.* **13**, 845–913.

59. Bootstrap confidence intervals for a class of parametric problems (1985). *Biometrika* **72**, 45–58.

60. The bootstrap method for assessing statistical accuracy (with R. Tibshirani) (1985). *Behaviormetrika* **17**, 1–35. Also appeared as: Bootstrap methods for standard errors, confidence intervals, and other measures of statistical accuracy (with R. Tibshirani) (1986). With discussion and a rejoinder by the authors. *Statist. Sci.* **1**, 54–77.

61. Why isn't everyone a Bayesian? (1986). *Amer. Statist.* **40**, 1–11.

62. How biased is the apparent error rate of a prediction rule? (1986). *J. Amer. Statist. Assoc.* **81**, 461–470.

63. Double exponential families and their use in generalized linear regression (1986). *J. Amer. Statist. Assoc.* **81**, 709–721.

64. Better bootstrap confidence intervals (1987). With discussion and a rejoinder by the author. *J. Amer. Statist. Assoc.* **82**, 171–200.

65. Did Shakespeare write a newly discovered poem? (with R. Thisted) (1987). *Biometrika* **74**, 445–455.

66. Probabilistic–geometric theorems arising from the analysis of contingency tables (with P. Diaconis) (1987). *Contributions to the Theory and Application of Statistics, A Volume in Honor of Herbert Solomon*, 103–125. Academic Press, New York.

67. Computer-intensive methods in statistical regression (1988). *SIAM Review* **30**, 421–449.

68. Logistic regression, survival analysis, and the Kaplan–Meier curve (1988). *J. Amer. Statist. Assoc.* **83**, 414–425.

69. Bootstrap confidence intervals: Good or bad? (1988). *Psychol. Bull.* **104**, 293–296.

70. Three examples of computer-intensive statistical inference (1988). *Sankhya 50th Anniversary Volume* **50**, 338–362. Presented at the *20th Interface Symposium on Computing Science and Statistics* and *COMPSTAT88*.

71. Application of the bootstrap statistical method to the tau-decay-mode problem (with K.G. Hayes and M.L. Perl) (1989). *Phys. Rev. D* **39**, 274–279.

72. Prognostic indicators of laparotomy findings in clinical stage I–II supradiaphragmatic Hodgkin's disease (1989). M.H. Leibenhaut, R.T. Hoppe, B. Efron, et al. *J. Clin. Oncol.* **7**, 81–91.

73. Fisher's information in terms of the hazard rate (with I. Johnstone) (1990). *Ann. Stat.* **18**, 38–62.

74. More efficient bootstrap computations (1990). *J. Amer. Statist. Assoc.* **85**, 79–89.

75. Regression percentiles using asymmetric squared error loss (1991). *Statistica Sinica* **1**, 93–125.

76. Compliance as an explanatory variable in clinical trials (with D. Feldman) (1991). With discussion and a rejoinder by the authors. *J. Amer. Statist. Assoc.* **86**, 9–26.

77. Statistical data analysis in the computer age (with R. Tibshirani) (1991). *SCIENCE* **253**, 390–395.

78. Poisson overdispersion estimates based on the method of asymmetric maximum likelihood (1992). *J. Amer. Statist. Assoc.* **87**, 98–107.

79. Jackknife-after-bootstrap standard errors and influence functions (1992). With discussion and a rejoinder by the author. *J. Roy. Statist. Soc. Ser. B* **54**, 83–127.

80. More accurate confidence intervals in exponential families (with T. DiCiccio) (1992). *Biometrika* **79**, 231–245.

81. Six questions raised by the bootstrap (1992). In *Exploring the Limits of Bootstrap* (R. LePage and L. Billard, eds.). John Wiley and Sons, New York.

82. A simple test of independence for truncated data with applications to redshift surveys (with V. Petrosian) (1992). *Astrophys. J.* **399**, 345–352.

83. Bayes and likelihood calculations from confidence intervals (1993). *Biometrika* **80**, 3–26.

84. *An Introduction to the Bootstrap (Monographs on Statistics and Applied Probability)* (with R. Tibshirani) (1993). Chapman and Hall, New York.

85. Multivariate analysis in the computer age (1993). In *Multivariate Analysis: Future Directions 2* (C.M. Cuadras and C.R. Rao, eds.). Elsevier Science Publishers, Amsterdam.

86. Survival analysis of the gamma-ray burst data (with V. Petrosian) (1994). *J. Amer. Statist. Assoc.* **89**, 452–462.

87. Missing data, imputation, and the bootstrap (1994). With discussion and a rejoinder by the author. *J. Amer. Statist. Assoc.* **89**, 463–479.

88. On the correlation of angular position with time of occurrence of gamma-ray bursts (with V. Petrosian) (1995). *Astrophys. J. Letters* **441**, L37–L38.

89. Testing isotropy versus clustering of gamma-ray bursts (with V. Petrosian) (1995). *Astrophys. J.* **449**, 216–223.

90. Computer-intensive statistical methods (with R. Tibshirani) (1995). Invited article for *Encyclopedia of Statistical Sciences*, 1–9. Wiley-Interscience, New York.

91. Empirical Bayes methods for combining likelihoods (1996). With discussion and a rejoinder by the author. *J. Amer. Statist. Assoc.* **91**, 538–565.

92. Using specially designed exponential families for density estimation (with R. Tibshirani) (1996). *Ann. Stat.* **24**, 2431–2461.

93. Bootstrap confidence intervals (with T. DiCiccio) (1996). *Statist. Sci.* **11**, 189–212.

94. Bootstrap confidence levels for phylogenetic trees (with E. Halloran and S. Holmes) (1996). *Proc. Nat. Acad. Sci.* **93**, 13429–13434.

95. Improvements on cross-validation: The .632+ bootstrap method (with R. Tibshirani) (1997). *J. Amer. Statist. Assoc.* **92**, 548–560.

96. The length heuristic for simultaneous hypothesis tests (1997). *Biometrika* **84**, 143–157.

97. Risk for retinitis in patients with AIDS can be assessed by quantitation of threshold levels of cytomegalovirus DNA burden in blood (1997). L. Rasmussen, D. Zipeto, R.A. Wolitz, A. Dowling, B. Efron and T.C. Merigan. *J. Infect. Dis.* **176**, 1146–1155.

98. A predictive morphometric model for the obstructive sleep apnea syndrome (1997). C.A. Kushida, B. Efron and C. Guilleminault. *Ann. Intern. Med.* **127**, 581–587.

99. Circadian rhythms and enhanced athletic performance in the National Football League (1997). R.S. Smith, C. Guilleminault and B. Efron. *Sleep* **20**, 362–365.

100. The problem of regions (with R. Tibshirani) (1998). *Ann. Stat.* **26**, 1687–1718.

101. R.A. Fisher in the 21st century (1998). With discussion and a rejoinder by the author. *Statist. Sci.* **13**, 95–122.

102. Nonparametric methods for doubly truncated data (with V. Petrosian) (1999). *J. Amer. Statist. Assoc.* **94**, 824–834.

103. HIV-1 genotypic resistance patterns predict response to saquinavir-ritonavir therapy in patients in whom previous protease inhibitor therapy had failed (1999). B. Efron, A.R. Zolopa, R.W. Shafer, et al. *Ann. Intern. Med.* **131**, 813–821.

104. The bootstrap and modern statistics (2000). *J. Amer. Statist. Assoc.* **95**, 1293–1296.

105. Selection criteria for scatterplot smoothers (2001). *Ann. Stat.* **29**, 470–504.

106. Infectious complications among 620 consecutive heart transplant patients at Stanford University Medical Center (2001). J.G. Montoya, L.F. Giraldo, B. Efron, et al. *CID* **33**, 629–640.

107. Empirical Bayes analysis of a microarray experiment (with R. Tibshirani, J.D. Storey and V. Tusher) (2001). *J. Amer. Statist. Assoc.* **96**, 1151–1160.

108. Microarrays empirical Bayes methods, and false discovery rates (with J.D. Storey and R. Tibshirani) (2001). Department of Statistics Technical Report 217, Stanford University. `efron.ckirby.su.domains/papers/`

109. Scales of evidence for model selection: Fisher versus Jeffreys (with A. Gous) (2001). With discussion and a rejoinder by the authors. In *IMS Lecture Notes–Monograph Series: Model Selection* **38** (P. Lahiri, ed.), 208-256.

110. Empirical Bayes methods and false discovery rates for microarrays (with R. Tibshirani) (2002). *Genet. Epidemiol.* **23**, 70–86.

111. The two-way proportional hazards model (2002). *J. Roy. Statist. Soc. Ser. B* **64**, 899–909.

112. Smoothers and the C_p, GML, and EE criteria: A geometric approach (with S.C. Kou) (2002). *J. Amer. Statist. Assoc.* **97**, 766–782.

113. Pre-validation and inference in microarrays (with R. Tibshirani) (2002). *Stat. Appl. Genet. Mol. Biol.* **1**, 1–8.

114. Robbins, empirical Bayes, and microarrays (2003). *Ann. Stat.* **31**, 366–378.

115. Bayesians, frequentists, and physicists (2003). *Proc. PHYSTAT2003*, 17–28.

116. Second thoughts on the bootstrap (2003). *Statist. Sci.* **18**, 135–140.

117. Bradley Efron: A conversation with good friends (with S. Holmes, C. Morris and R. Tibshirani) (2003). *Statist. Sci.* **18**, 268–281.

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