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## VITA

**Lawrence D. Brown**

Date of Birth: 12/16/40

### Education

B.S.	1961	California Institute of Technology
Ph.D.	1964	Cornell University

### Positions

Miers Busch Professor, Department of Statistics, The Wharton School, University of Pennsylvania, 1994-present  
Professor, Department of Mathematics, Cornell University, 1978-94  
Professor, Department of Mathematics, Rutgers University, 1972-78  
Associate Professor, Department of Mathematics, Cornell University, 1966-72  
Assistant Professor, Department of Statistics, University of California at Berkeley, 1965-66

### Honors, Fellowships, and Grants

NSF Graduate Fellowship (1961-64)  
NAS-NRC, AFOSR Postdoctoral Fellow (1964-65)  
NSF Summer research support (1965-)  
Sloane Foundation Postdoctoral Fellow (1969-71)  
Fellow of the Institute of Mathematical Statistics (I.M.S.)  
Wald Lecturer, Institute of Mathematical Statistics, August 1985  
Lady Davis Professorship (Hebrew Univ., Jerusalem, 1988)  
Member, National Academy of Sciences  
Doctor of Science (Honorary), Purdue University, 1993  
Recipient, Wilks Award of the American Statistical Association, 2002

### Professional Activities

Member Institute of Mathematical Statistics (= I.M.S.) ("I.M.S. fellow"), American Statistical Association and International Statistical Institute  
Associate Editor, Annals of Statistics (1970-80, 1983-94, 1999 - )  
Associate Editor, Annals of Probability (1985-88)  
I.M.S. Committees: Publications (1975-78), Special Invited Papers (1989-1991), Selection of editors (1990-91)  
Member I.M.S. Council (1979-82)  
Director, Cornell Statistics Center (1982-83, 1986-88, 1989-1993)  
Member, Board on Mathematical Sciences of the National Research Council (=NRC) (1989-94)

President, I.M.S. (1992-93)  
Member, Committee on Applied and Theoretical Statistics of the NRC (1994-1997)  
Co-Editor, Annals of Statistics (1995-1998)  
Member, NRC Commission on Physical Sciences, Mathematics, and Applications (1996-1999)  
Member, Advisory Committee for the Hong Kong Institute of Mathematical Sciences (1996-1997)  
Member, NSA Research Grant Review Panel (1997- 2001)  
Testimony to U.S. Senate Governmental Affairs Committee concerning year 2000 U.S. Census (1997), and to U.S. House of Representatives Committee (1998)  
Member, NSF Research Grant Pre-review Panel (1998, 2000)  
Member, NRC Select Panel to Oversee the 2000 Census (1998- )  
Member, NRC Committee on National Statistics (1999- )  
Section Head, NAS, Section 32 (Applied Mathematics, Probability and Statistics)

Ph.D. Thesis students (1970 - present):

F. Hsuan, J. O. Berger, T. Meyer, S. Groshen, H. Proskin, C. Gatsonis, I. M. Johnstone, A. Mandelbaum, M-S Chow, E. Greenshtein, M. G. Low, K. He, Y-L Tseng, T. Cai, Y. Lin, Y. Wang, S. Li, W. Mao, R. Zhang, H. Shen (expected 2003), M. Levins (expected 2003), X. Li (expected 2003), Z. Zhao (expected 2003)

Visiting Positions:

Birkbeck College (London University) (1964-65), Technion (Haifa, Israel) (1981-82), Hebrew University (Jerusalem, Israel) (1983-85 and 1988-89), UCLA (1993-94)

Publications - Lawrence D. Brown

- (1964) Sufficient statistics in the case of independent random variables, Ann. of Math. Statist., 35, 1456-1475.
- (1965) Optimal policies for a sequential decision process, J. Soc. Indust. Appl. Math., 13, 37-46.
- (1966) On the admissibility of invariant estimators of one or more location parameters, Ann. Math. Statist., 37, 1087-1136.
- (1967) The conditional level of Student's t test, Ann. Math. Statist., 38, 1068-1071.
- (1968) Inadmissibility of the usual estimators of scale parameters in problems with unknown location and scale parameters, Ann. Math. Statist., 39, 29-48.
- (1971a) Non-local asymptotic optimality of appropriate likelihood ratio tests, Ann. Math. Statist., 42, 1206-1241.

- (1971b) Admissible estimators, recurrent diffusions, and insoluble boundary value problems, Ann. Math. Statist., 42, 855-904. See also correction in Ann. Statist., 1, (1975) 594-596.
- (1973) Measurable selections of extrema (with R. Purves), Annals of Statistics, 1, 1902-912.
- (1974a) Admissibility in Statistical Problems Involving a Location or Scale Parameter (with M. Fox), Annals of Statistics, 1, 1902-912.
- (1974b) Admissibility of procedures in two dimensional location parameter problems (with M. Fox), Annals of Statistics, Vol. 2, 248-266.
- (1974c) Point and confidence estimation of a common mean and recovery of interblock information (with A. Cohen), Annals of Statistics, 2, 963-976.
- (1975a) On a theorem of Morimoto concerning sufficiency for discrete distributions. Annals of Statistics, 3, 1180-1182.
- (1975b) Estimation with incompletely specified loss functions (the case of several location parameters), Jour. of Amer. Statist. Assoc., 70, 417-427.
- (1976) A complete class theorem for strict monotone likelihood ratio with applications (with A. Cohen and W. Strawderman), Annals of Statistics, 4, 712-722.
- (1977a) Closure theorems for sequential-design processes, Statistical Decision Theory and Related Topics II, Academic Press, Inc., 57-91.
- (1977b) Minimax estimation of a normal mean vector for arbitrary quadratic loss and unknown covariance matrix (with J. Berger, M. Bock, G. Casella, and L. Gleser), Annals of Statistics, 5, 763-771.
- (1977c) "Comment" on Conditional confidence statements and confidence estimators, Jour. Amer. Statist. Assoc., 72, 810-813.
- (1978a) A contribution to Keifer's theory of conditional confidence procedures, Ann. Statist., 6, 59-71.
- (1978b) Sequential Bahadur Efficiency (with R. Berk), Ann. Statist., 6, 567-581.
- (1979a) Counterexample -- an inadmissible estimator which is generalized Bayes for a prior with light tails, Jour. Multiv. Anal., 9, 332-336.

- (1979b) A heuristic method for determining admissibility of estimators -- with application, Ann. Statist., 7, 960-994.
- (1979c) On the admissibility or inadmissibility of fixed sample size tests in a sequential setting (with A. Cohen and W. Strawderman), Ann. Statist., 7, 569-579.
- (1979d) Monotonicity of Bayes sequential tests (with A. Cohen and W. Strawderman), Ann. Statist., 7, 1222-1230.
- (1979e) A proof that the Tukey-Kramer multiple comparison procedure for differences between treatment means is level  $-\alpha$  for 3, 4, or 5 treatments, Technical report, Statistics Center, Cornell University.
- (1980a) A necessary condition for admissibility, Ann. Statist., 8, 540-545.
- (1980b) Examples of Berger's phenomenon in the estimation of independent normal means, Ann. Statist., 8, 572-586.
- (1980c) Complete classes for the sequential test of hypotheses (with A. Cohen and W. Strawderman), Ann. Statist., 8, 377-398.
- (1980d) Existence of optimal policies in stochastic dynamic programming (with B. Doshi), Prob. and Math. Statist. (Poland), 1, 171-184.
- (1981a) Properties of Bayes sequential tests (with R. Berk and A. Cohen), Ann. Statist., 9, 678-682.
- (1981b) Bounded stopping times for a class of sequential decision processes (with R. Berk and A. Cohen), Ann. Statist., 9, 834-845.
- (1981c) Variation diminishing transformations: a direct approach to total positivity and its statistical applications (with I. Johnstone, B. MacGibbon), Jour. Amer. Statist. Assoc., 76, 824-833.
- (1981d) Inadmissibility of large classes of sequential tests (with A. Cohen), Ann. Statist., 9, 1289-1300.
- (1981e) A complete class of large classes of sequential tests (with A. Cohen), Ann. Statist., 9, 1289-1249.
- (1982a) A unified admissibility proof (with J. Hwang), Proc. Third Purdue Symp., 205-288.
- (1982b) A proof of the central limit theorem motivated by the Cramer-Rao inequality, Essays

in Honor of C.R. Rao, ed. by P.R. Krishnaiah, 141-148.

- (1982c) Admissibility and complete class results for the multinomial estimation problem with entropy and squared error loss (with A. Ighodaro and T. Santner), Jour. Multiv. Anal., 12, 469-479.
- (1983a) A sharp necessary condition for admissibility of sequential tests -- necessary and sufficient conditions for admissibility of SPRT's (with A. Cohen and E. Samuel-Cahn), Ann. Statist., 11, 640-653.
- (1983b) Comments on "the robust Bayesian viewpoint", by James Berger in Robustness of Bayesian Analyses, ed. by J.B. Kadane, Elsevier Science, 126-133.
- (1984a) The research of Jack Kiefer outside the area of experimental design, Ann. Statist., 12, 406-415.
- (1984b) An alternative to Student's t-test for problems with indifference zones (with H. Sackrowitz), Ann. Statist., 12, 451-469.
- (1984c) A note on the Tukey-Kramer procedure for pairwise comparisons of correlated means. In Design of Experiments, ed. by T.J. Santner and A.C. Tamhane, Marcel Dekker, Inc. 1-6.
- (1984d) Hodges-Lehmann efficiencies for likelihood ratio type tests in curved bivariate normal families (with F.H. Ruymgaart and D.R. Truax), Statist. Neerlandica, 38, 21-35.
- (1985a) All admissible linear estimators of a multivariate Poisson mean vector (with R. Farrell), Ann. Statist., 13, 282-194.
- (1985b) Complete class theorems for estimation of multivariate Poisson means and related problems (with R. Farrell), Ann. Statist., 13, 706-726.
- (1985c) Jack Carle Kiefer Collected Papers (ed. with I. Olkin, J. Sacks, H.P. Wynn) 3 vols., Springer-Verlag, New York.
- (1986a) Tail behaviour for suprema of empirical processes (with R. Adler), Ann. Prob., 14, 1-30.
- (1986b) Some limitations on Stein's phenomenon (with J. Hwang), Comm. in Statist., 15, 2025-2043.
- (1986c) Jack Carl Kiefer Collected Papers Supplementary Volume (ed. with I. Olkin, J.

Sacks. H.P. Wynn), Springer-Verlag, New York.

- (1986d) Commentary on paper [19] (Invariance, sequential estimation and continuous time processes) in J.C. Kiefer Coll. Papers, Supp. Vol. Springer-Verlag, New York.
- (1986e) Fundamentals of Statistical Exponential Families with Applications in Statistical Decision Theory, Inst. of Math. Statist., Hayward, California.
- (1988a) The differential inequality of a statistical estimation problem, in Statist. De. Thry. and Rel. Topics, IV, Vol. 1 (S. S. Gupta and J. O. Berger, eds.), 299-323.
- (1988b) Proof of a necessary and sufficient condition for admissibility in discrete multivariate problems (with R. Farrell), Jour. of Multiv. Anal., 24, 46-52.
- (1988c) Inequalities for multivariate infinitely divisible processes (with Y. Rinott), Ann. Prob., 16, 642-657.
- (1988d) Review of Asymptotic Methods in Statistical Decision Theory by L. Le Cam, Jour. Amer. Statist. Assoc., 83, 564-565.
- (1988e) Admissibility in discrete and continuous invariant nonparametric estimation problems and their multinomial analogs, Ann. Statist., 16, 1567-1593.
- (1989a) Universal domination and stochastic domination: U-admissibility And U-inadmissibility of the least squares estimator (with J. Hwang), Ann. Statist., 17, 252-267.
- (1989b) Complete class results for hypothesis testing problems with simple null hypotheses (with J.I. Marden), Ann. Statist., 17, 209-235.
- (1989c) Correction to "Complete classes for sequential tests of hypotheses (with A. Cohen and W.E. Strawderman)", Ann. Statist., 17, 1414-1416.
- (1989d) The minimax risk for estimating a bounded normal mean (with I. Feldman) Tech. Report Cornell Statistics Center.
- (1990a) Tests and confidence bands for bivariate cumulative distribution functions (with R. Adler and K-L. Lu), Comm. in Statist. (Simul. and Comput.), 19, 25-36.
- (1990b) Comment on "Developments in Decision-Theoretic Variance Estimation" by J.M. Maatta and G. Casella, Statist. Sci., 5, 103-106.
- (1990c) An ancillarity paradox which appears in multiple linear regression (with discussion)

Ann. Statist., 18, 471-538.

- (1990d) Information inequalities for the Bayes risk (with L. Gajek), Ann. Statist., 18, 1578-1594.
- (1990e) A lower bound for the risk in estimating the value of a probability density (with R.H. Farrell), Jour. Amer. Statist. Assoc., 85, 1147-1154.
- (1990f) Admissibility of confidence estimators (with J. Hwang) Tech. Report Cornell Statistics Center
- (1990g) Tables for tests and confidence bands for bivariate cumulative distribution functions (with R. Adler and K-L. Lu), Tech. Report Cornell Statistics Center.
- (1990h) Comment on "Developments in decision theoretic variance estimation", Statist. Sci., 5, 103-106.
- (1991a) Information inequality bounds on the minimax risk (with an application to nonparametric regression) (with M. Low) Ann. Statist., 19, 329-337.
- (1991b) Estimated confidence under the validity constraint (with J. Hwang) Ann. Statist., 19, 1964-1977.
- (1992a) Two sided sequential tests (with E. Greenshtein) Ann. Statist., 20, 545-554.
- (1992b) On the admissibility of the maximum likelihood estimator of the binomial variance (with M. Chow and D.K.H. Fong) Can. Jour. of Statist., 20, 353-358.
- (1992c) Local admissibility and local unbiasedness in hypothesis testing problems (with J. Marden) Ann. Statist., 20, 832-852.
- (1993a) Non-existence of informative unbiased estimators in singular problems (with R.C. Liu) Ann. Statist., 21, 1-13.
- (1993b) The asymptotic risk in a signal parameter estimation problem (with R.C. liu) IEEE Trans. on Inf. Thry., 39, 254-257.
- (1993c) Bounds on the Bayes and minimax risk for signal parameter estimation (with R.C. Liu) IEEE Trans. on Inf. Thry., 39, 1386-1394.
- (1993d) How to approximate a histogram by a normal density (with J. Hwang) Amer. Statist., 47, 251-256.

- (1993e) An information inequality for the Bayes risk under truncated squared error loss, in *Multivariate Analysis: Future Directions* (ed. C.R. Rao), 85-94, Elsevier Science, Amsterdam.
- (1993f) Minimality, more or less, in *Statistical Decision Theory and Related Topics V*, 1-18, Springer, N.Y.
- (1994a) A unified conditional frequentist and Bayesian test for fixed and sequential simple hypothesis testing (with J.O. Berger and R.L. Wolpert) *Ann. Statist.*, 22, 1787-1807.
- (1994b) Racetrack betting: do bettors understand the odds? (with R. D-Amato and R. Gertner) *Chance*, 7, 17-23.
- (1995a) Complete classes for confidence set estimation (with A. Cohen) *Statistica Sinica*, 5, 291-302.
- (1995b) Optimal confidence sets, bioequivalence, and the limaçon of Pascal *Jour. Amer. Statist. Assoc.*, 90, 880-889.
- (1996a) Asymptotic equivalence of nonparametric regression and white noise (with M. G. Low) *Ann. Statist.*, 24, 2384-2398.
- (1996b) A constrained risk inequality with applications to nonparametric function estimation (with M.G. Low) *Ann. Statist.*, 24, 2524-2535.
- (1997a) Good exact confidence sets for a multivariate normal mean (with Y-L Tseng) *Ann. Statist.* 25,2228-2258.
- (1997b) An unbiased test for the bioequivalence problem (with J.T.G. Hwang and A. Munk) *Ann. Statist.*,25,2345-2367.
- (1997c) Superefficiency in nonparametric function estimation (with M.G. Low and L.H. Zhao) *Ann. Statist.*,25,2607-2625.
- (1998a) Minimax Theory, entry in *Encyclopedia of Biostatistics*, eds. P. Armitage and T. Colton.
- (1998b) Asymptotic non-equivalence of nonparametric experiments when the smoothness index is  $\frac{1}{2}$ . (with C-H Zhang) *Ann. Statist.* 26 279-287.
- (1998c) Wavelet shrinkage for nonequispaced samples (with T.Cai) *Ann. Statist.* 26 1783-1799

- (1999a) Wavelet estimation for samples with random uniform design (with T. Cai) Statistics and Prob. Letters 42 313-321
- (1999b) Statistical controversies in census 2000 (with M.L. Eaton, D.A. Freedman, S.P. Klein, R.A. Olshen, K.W. Wachter, M.T. Wells and D. Ylvisaker) Jurimetrics 39 347-376
- (2000a) An essay on statistical decision theory, Jour. Amer. Statist. Assoc. 95 1277-1282
- (2000b) Testing average equivalence-finding a compromise between theory and practice (with A. Munk and J.T.G. Hwang) Biometrical Jour. 5 531-552
- (2000c) An algorithmic construction of optimal minimax designs for heteroscedastic regression models (with W-K Wong) Jour. Statist. Plan. and Inference. 85 103-114
- (2001a) Interval estimation for a binomial proportion (with T. T. Cai and A. DasGupta), Statistical Science 16 101-133 (with discussion)
- (2001b) Decision Theory, classical *in* International Encyclopedia of the Social & Behavioral Sciences P. B. Baltes and N. J. Smelser, eds.
- (2002a) Confidence intervals for binomial proportions and asymptotic expansions, (with T. T. Cai and A. DasGupta), Ann. Statist. 30 160-201
- (2002b) Asymptotic equivalence theory for nonparametric regression with random design (with T. T. Cai, M.G. Low and C-H Zhang), Ann. Statist., 30 688-707
- (2002c) A new test for the Poisson distribution (with L. H. Zhao) Sankhya, to appear
- (2002d) Statistical equivalence at suitable frequencies of GARCH and stochastic volatility models with the corresponding diffusion model (with Y. Wang and L. H. Zhao) Statistica Sinica, to appear
- (2002e) Discussion of “random rates in anisotropic regression” by Hoffman and Lepski, (with Y. Lin) Ann. Statist. 30 363-369
- (2002f) Direct asymptotic equivalence of nonparametric regression and the infinite-dimensional location problem (with L. H. Zhao), submitted
- (2002g) Asymptotic equivalence theory for a Poisson process with variable intensity (with A. Carter, M. G. Low and C-H Zhang), submitted
- (2002h) Statistical analysis of a telephone call center: a queueing science perspective (with N.

Gans, A. Mandelbaum, A. Sakov, H. Shen, S. Zeltyn, and L. H. Zhao), technical report

(2002i) Multifactor Poisson and Gamma-Poisson models for call center arrival times (with A. Mandelbaum, A. Sakov, H. Shen, S. Zeltyn, and L. H. Zhao), technical report

(2002j) Interval estimation in exponential families (with T. T. Cai and A. DasGupta), Statistica Sinica, to appear

(2002k) Racetrack betting and consensus of subjective probabilities (with Y. Lin), submitted