Cumulative Bio-Bibliography
University of California, Santa Cruz
David Draper
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The signature below indicates that the following information has been reviewed for accuracy, and that this bio-bibliography information may be released to the public.

_____ Date: 17 October 2005

EMPLOYMENT HISTORY

- **IBM**. 1974–1975: Mathematician and Systems Analyst, The IBM Corporation, Poughkeepsie, New York.
- **Chicago**. 1981–1984: Research Associate (Assistant Professor) and Statistical Consulting Service Program Director, Department of Statistics, University of Chicago, Chicago, Illinois.
- **RAND**. 1984–1992: Associate Statistician (1984–1988) and Statistician (1989–1990), Statistical Research and Consulting Group, Department of Economics and Statistics, The RAND Corporation, Santa Monica, California. Consultant, Statistics Group (1990–1991). Faculty, RAND Graduate School of Policy Studies (1985–1992).
- **Seattle**. March–June 1986: Visiting Lecturer, Department of Statistics, University of Washington, Seattle.
- **Consultant**. 1987: AT&T Bell Laboratories, Murray Hill, New Jersey. 1978–Present: Private statistical consultant, Berkeley, California; Chicago, Illinois; Santa Monica, California; Bath, UK; and Santa Cruz, CA.
- **UCLA**. 1990–1993: Visiting Lecturer, Division of Statistics, Department of Sociology, University of California, Los Angeles (April–June 1990). Visiting Professor, Division of Statistics, Department of Mathematics (1991–1993). Associate Director, Statistical Consulting Center (1992–1993).
- **Bath**. 1993–2000: Lecturer (1993–1995), Reader (1995–1999), and Professor (1999–2000), Statistics Group, Department of Mathematical Sciences, University of Bath, UK. Head of Statistics Group (1999–2000). Visiting Professor, Statistics Group (2003–2006). (In the British academic system the Lecturer and Reader titles are roughly equivalent to Assistant and junior full Professors in the US, respectively, and Professor corresponds roughly to a senior US full Professor.)

- **Neuchâtel**. 1995–1997: Visiting Professor, Statistics Group, University of Neuchâtel (part-time teaching in an M.S. degree program).
- **Santa Cruz**. 2001–present: Professor (currently Step 5 offscale) and founding Chair, Department of Applied Mathematics and Statistics, Baskin School of Engineering, University of California, Santa Cruz.

EDUCATION

- **Undergraduate study**. 1970–1974, University of North Carolina, Chapel Hill. B.S., *summa cum laude*, in Mathematics awarded 1974.
- **Graduate study**. 1975–1981, University of California, Berkeley. M.A. in Statistics awarded 1980; Ph.D. in Statistics awarded 1981 (dissertation advisor: E Lehmann).

PROFESSIONAL COMPETENCE AND ACTIVITY

Memberships in Honorary Societies

- Phi Eta Sigma and Phi Beta Kappa, 1974; Sigma Xi, 1984.

Honors and Awards

- Bachelor of Science degree in mathematics awarded with highest honors, University of North Carolina, Chapel Hill, 1974.
- Recipient, *Llewellyn John and Harriet Manchester Quantrell Award for Excellence in Undergraduate Teaching*, University of Chicago, 1984. (This is a major teaching award, given each year at the University of Chicago to only two or three people.)
- Fellow, Royal Statistical Society, 1990.
- Nominated for graduate teaching excellence awards at the RAND Graduate School of Policy Studies (1990, 1991).
- Chartered Statistician, Royal Statistical Society, 1993–present.
- In each of 1993, 1994, and 2003 I presented a discussion paper before the *Royal Statistical Society*. (Only a handful of papers per year are singled out for this research honor.)
- Nominated for the *Mary Tasker Award* for excellence in undergraduate teaching at the University of Bath (1997, 1999).

- *Excellence in Continuing Education* award, American Statistical Association (1998); presented for the research short course *Bayesian Hierarchical Modeling*, given at the American Statistical Association annual meeting, Anaheim CA, 1997. (Only one of these awards is given each year; in 1997 my research short course was chosen from among 19 such courses.)

- President-Elect, President, and Past-President of the *International Society for Bayesian Analysis* (ISBA), 2001–2003.

- Chosen as the presenter of the keynote 3–day research short course (on Bayesian hierarchical modeling) given at the *27th Annual Summer Institute of Applied Statistics*, 19–21 Jun 2002, Brigham Young University, Provo UT. (Only one person per year receives this research honor.)

- Honorable Mention, 2002–03 *Excellence in Teaching Award*, University of California, Santa Cruz (UCSC); nominated for the 2002–03 UCSC *Alumni Association Distinguished Teaching Award*; nominated for the 2002–03 UCSC *STARS Teacher of the Year Award*. (Only a handful of people per year are singled out for these teaching honors.)

- *Excellence in Continuing Education* award, American Statistical Association (2004); presented for the research short course *Intermediate/Advanced Bayesian Hierarchical Modeling*, given at the American Statistical Association annual meeting, San Francisco CA, 2003. (Only one of these awards is given each year; in 2003 my research short course was chosen from among 34 such courses.)

- Honorable Mention, 2003–04 *Excellence in Teaching Award*, University of California, Santa Cruz (UCSC). (Only 7 faculty were chosen for this teaching honor in 2004.)

- Chosen as the co-presenter of the keynote 3–day research short course (on practical Bayesian non-parametric and semi-parametric modeling) given at the *30th Annual Summer Institute of Applied Statistics*, 15–17 Jun 2005, Brigham Young University, Provo UT. (Only one person or set of co-presenters per year receives this research honor.)

- Honorable Mention, 2004–05 *Excellence in Teaching Award*, University of California, Santa Cruz (UCSC); nominated for the 2004–05 UCSC *Alumni Association Distinguished Teaching Award*. (Only a handful of people per year are nominated for these teaching honors.)

Grant and Contract Support (1993–Present)

G1 (awarded) **Draper D** (1993–2005). $189,900 from the UK Engineering and Physical Sciences Research Council (EPSRC), the European Commission, the UK Royal Society, the University of Bath, and a variety of organizing committees for international research conferences for Ph.D. students (7), conference travel grants (17), and 1-year student training and research placements (4), from 1993 to the present.

G2 (awarded) **Draper D**, Parmigiani G, West M (1995). *International Workshop on Model Uncertainty and Model Robustness*. $41,416 from the EPSRC, the US National Science Foundation, and the University of Bath, to run an International Workshop on Model Uncertainty and Model Robustness in Bath, June 30–July 2, 1995. The Workshop brought

together 88 researchers from 15 countries for 18 invited talks, 9 invited discussions, and 46 posters.

G3 (awarded) **Draper D**, Pereira A, Prado P, Saltelli A (1996). ***GESAMAC****: Conceptual and Computational Tools to Assess the Long-Term Risk from Nuclear Waste Disposal in the Geosphere.* $558,327 over 3 years from the European Commission (for a postdoctoral Research Officer, equipment, and travel), to perform model uncertainty and sensitivity analysis calculations in risk assessment studies of groundwater contamination from nuclear waste repositories, Jan 1996–Dec 1998.

G4 (awarded) **Draper D** (1998). *Bayesian Nonparametric Methods in Nuclear Waste Disposal Risk Assessment.* $31,383 over 6 months from AEA Technology plc, UK (for a postdoctoral Research Officer, travel, and consulting fees) to perform nonparametric Bayesian calculations in an effort to provide more stable risk estimates involving possible groundwater contamination from nuclear waste repositories under scenarios leading to low radiation doses with high probability and very high doses with very low probability, Nov 1997–Apr 1998.

G5 (awarded) Chambers R, **Draper D**, Jones T, Nordberg L, Skinner C (1998). *Model Quality Reports in Business Statistics.* $547,420 over 1 year from Eurostat (for a postdoctoral Research Officer, equipment, and travel), to advise the European Community on best-practice methodology in the design and analysis of complex sample surveys, Jan–Dec 1998.

G6 (awarded) **Draper D** (2002). *International Workshop on Bayesian Data Analysis.* $88,367 from (among other funders) the US National Science Foundation, the University of California (Santa Cruz), NASA Ames Research Laboratories, and CTB/McGraw-Hill to run an International Workshop on Bayesian Data Analysis in Santa Cruz, 8–10 Aug 2003. This Workshop brought together approximately 160 researchers from 15 countries on 5 continents for 26 invited talks and 75 posters; electronic proceedings are available at `www.ams.ucsc.edu/bayes03`, which has so far been visited more than 11,400 times.

G7 (awarded) Romano P, **Draper D** (2002). *Perinatal Outcomes for Medical Mothers and Babies.* $27,194 from the California Healthcare Foundation, to perform an empirical analysis of physician- and hospital-level effects as part of the Maternal Outcomes Reporting Initiative, Apr 2003–Mar 2006.

G8 (awarded) **Draper D**, Krnjajić M (2003). *Cluster Analysis Via Bayesian Nonparametric Density Estimation.* $30,000 from NASA Ames to investigate Bayesian methods for classifying pixels in satellite images on a four-point ordered categorical scale of cloudiness, by applying mixture models with unknown numbers of components in the context of massive data sets, Feb–Sep 2004.

G9 (awarded) **Draper D** (2004). *Understanding Variations in Death Rates in Veterans Administration Intensive Care Units.* $15,000 from the Department of Veterans Affairs (Palo Alto Health Care System), to perform a hierarchical random-effects logistic regression analysis to explain variations in death rates in intensive care units in VA hospitals around the U.S., Jul 2004–Dec 2005.

G10 (awarded) **Draper D** (2004). *A Case-Study-Based Contemporary Calculus Course.* $8,088 from the UCSC Center for Teaching Excellence to develop an innovative course, Contemporary Calculus I, which will be case-study based and which will combine traditional paper-and-pencil methodological learning with lab-based numerical and symbolic computing, July 2004–June 2005.

G11 (awarded) Towbin P, **Draper D** (2004). *Mathematical and Statistical Models of Cooperation and Conflict in Environmental Resource Use.* $162,317 over 4 years from the University of California Institute on Global Conflict and Cooperation, to provide fellowship money for P Towbin's Ph.D. study, July 2004–June 2008.

G12 (awarded) **Draper D** (2004). *Bayesian Modeling and Inference for Improved Medical Processes and Outcomes.* $50,000 from the Division of Research at Kaiser Permanente, for design and analysis work on a variety of projects (e.g., an innovative method for migrating methods from the intensive care unit to the general wards and emergency room to prevent unnecessary deaths from sepsis), Aug 2004–Aug 2006.

G13 (awarded) **Draper D** (2004). *Bayesian Modeling and Decision-Making in Industrial Process Control.* $15,000 from the Statistics Group at Pratt & Whitney, for design and analysis work on improved risk assessment in engineering the manufacturing process for jet engines, Nov 2004–Oct 2006.

G14 (pending) **Draper D**, Gearhart C (2005). *Bayesian statistical modeling of the relationship between air quality and mortality: In pursuit of accurate uncertainty bands and better environmental policy.* $120,000 requested from the University Research Program at Ford Motor Company, for improved analysis (via Bayesian model averaging and hierarchical modeling) of the relationship between air quality and mortality, Mar 2006–Feb 2008.

G15 (pending) Escobar G, **Draper D**, et al. (2005). *Sepsis and critical illness in babies* ≥ 34 *weeks gestation.* $1,670,000 requested from the National Institute of Child Health and Human Development (a branch of the National Institutes of Health, January 2006–December 2008. Proposes novel clinical and statistical methods, involving dynamic linear modeling, to take advantage of the Kaiser hospital chain's soon-to-be-available electronic clinical data base to create dynamically-updated severity of illness scores for newborn babies in the first 72 hours of life. I am the lead statistical consultant on this project.

WRITINGS AND CREATIVE ACTIVITIES IN PROGRESS

Numbers in boxes refer to the sequential publication numbering in Section I. on the web page `www.ams.ucsc.edu/~draper/writings.html` .

IP1 (article, in progress) Krnjajić M, **Draper D**, Kottas T. Parametric and nonparametric Bayesian model specification: a case study (22 pages). (In this paper, which is about 75% finished, we undertake a simulation study to explore the ability of Bayesian parametric and nonparametric models to provide an adequate fit to count data, of the type that would routinely be analyzed parametrically either through fixed-effects or random-effects Poisson models. The context of the study is a

randomized controlled trial with two groups (treatment and control). Our nonparametric approach utilizes several modeling formulations based on Dirichlet process (DP) mixture and mixtures of DP priors. We find that the nonparametric models are able to flexibly adapt to the data, to offer rich posterior inference, and to provide, in a variety of settings, more accurate predictive inference than parametric models.) 72

IP2 (book, in progress) **Draper D**. *Thinking About Uncertainty: An Introduction to Probability and Statistics*. Contract offered. (This is an introductory text, mainly on statistics, for a lower-division undergraduate audience like the students in AMS 5 at UCSC; I'm about 60% finished with it. To date I've taught more than 1,600 students from the partially-finished book at 6 universities in the U.S. and U.K.) 73

IP3 (book, in progress) **Draper D**. *Bayesian Hierarchical Modeling*. Contract offered. (I am about 35% finished with this 500–page book, which is meant to be a definitive monograph on the subject, illustrating the standard methodologies (and some new ones) with many case studies. I have made two chapters of this book, together with associated software, available for free on the web; to date more than 3,000 people from at least 19 countries have downloaded this material.) 74

IP4 (book, in progress) **Draper D**. *Bayesian Modeling, Inference and Prediction.* Contract offered. (I am about 85% finished with this 450–page book, which uses many case studies and mixes theoretical and methodological ideas with symbolic and numerical computing in `Maple` and `R` to create a graduate-level introduction to Bayesian modeling.) 75

PUBLISHED WRITINGS AND CREATIVE ACTIVITIES

Books and Monographs

BM1 **Draper D**, Gaver D, Goel P, Greenhouse J, Hedges L, Morris C, Tucker J, Waternaux C (1993). *Combining Information: Statistical Issues and Opportunities for Research*. Contemporary Statistics Series, No. 1. Alexandria VA: American Statistical Association (210 pages). (Report produced by panel convened by U.S. National Research Council, 1990–1992, to survey the state of the art in meta-analysis, hierarchical modeling, and other methods for combining information from several sources to produce more informative summaries and better decisions than those possible based only on the separate information sources. I wrote about 40% of the book and edited all of it. Citation data unavailable.) 23

BM2 **Draper D**, Pereira A, Prado P, Saltelli A, Cheal R, Eguilior S, Mendes B, Tarantola S (1998). GESAMAC: *Conceptual and Computational Tools to Assess the Long-Term Risk from Nuclear Waste Disposal in the Geosphere*. Brussels: European Commission, EUR 19113 EN (90 pages). (Report produced by team of physicists, statisticians, and risk analysts from England, Italy, Spain, and Sweden, offering novel methods for risk assessment in nuclear waste disposal. I wrote about 30% of the report and edited all of it. Citation data unavailable.) 40

BM3 Bergdahl M, Black O, Bowater R, Chambers R, Davies P, **Draper D**, Elvers E, Full S, Holmes D, Lundqvist P, Lundström S, Nordberg L, Perry J, Pont M, Prestwood M, Richardson I, Skinner C, Smith P, Underwood C, Williams M (1999). *Model Quality Reports in Business Statistics*. Luxembourg: Eurostat (416 pages in four volumes). (Report

produced by team consisting of people from the Office for National Statistics (UK), Statistics Sweden, and the Universities of Bath and Southampton (UK), on best practice in evaluating the design and analysis of complex sample surveys. I co-edited the entire book and co-wrote two chapters in it. Citation data unavailable.) [50]

BM4 Rasbash J, Browne WJ, Goldstein H, Yang M, Plewis I, Healy M, Woodhouse G, **Draper D**, Langford I, Lewis T (2000). *A User's Guide to* `MLwiN`™, Version 2.1d. London: Institute of Education, University of London (286 pages; ISBN 085473 6123). (Bill Browne and I are the co-developers of the initial MCMC capabilities in this multi-level modeling package, with a user base of more than 2,300 people worldwide. I co-edited this entire book and co-wrote about 20% of it. Citation data unavailable.) [53]

Articles (Refereed)

Citation data (from the *Web of Science*, and available only for articles) were current as of October 2005; self-citations were removed. Summary across writings where citation data are available: 2,223 total citations; mean 79, median 56; 3 articles with more than 200 citations, 5 with more than 150, 11 with more than 100, 15 with more than 50. For comparison, a random sample of *Web of Science* entries indicates that the median number of citations of a paper in a leading statistics journal 10 years after publication is 4 (95% interval, 0–12).

A1 Dubois R, Rogers W, Moxley III J, **Draper D**, Brook R (1987). Hospital inpatient mortality: Is it a predictor of quality? (with discussion) *New England Journal of Medicine*, **317**, 1674–1680. (Demonstrates that inpatient mortality by itself is a poor marker for quality of hospital care. I was responsible for about 40% of the effort leading to this article. **209** citations [most recent June 2005], in cardiology, economics, epidemiology, health policy, nursing, internal medicine, surgery, and statistics, in journals published in Australia, Canada, France, Germany, Spain, the UK, and the US.) [1]

A2 **Draper D** (1988). Rank-based robust analysis of linear models (with discussion and rejoinder). *Statistical Science*, **3**, 239–271. (Shows how estimators of location based on rank-tests can be used to produce robust inferences in regression and analysis of variance. **28** citations [most recent December 2003], in econometrics, epidemiology, psychology, and statistics, in journals published in the UK and the US.) [5]

A3 Daley J, Jencks S, **Draper D**, Lenhart G, Thomas N, Walker J (1988). Predicting hospital-associated mortality for Medicare patients with stroke, pneumonia, acute myocardial infarction, and congestive heart failure. *Journal of the American Medical Association*, **260**, 3617–3624. (Results of a two-year $1,500,000 study showing how to measure sickness at admission and predict death status for elderly patients with high-mortality diseases. I was responsible for about 35% of the effort leading to this article. **222** citations [most recent September 2005], in cardiology, epidemiology, geriatrics, health care financing, internal medicine, pharmacology, psychology, and statistics, in journals published in Germany, Singapore, the UK, and the US.) [6]

A4 Jencks S, Daley J, **Draper D**, Thomas N, Lenhart G, Walker J (1988). Interpreting hospital mortality data: The role of clinical risk adjustment. *Journal of the American Medical Association*, **260**, 3611–3616. (Together with the previous article, examines a value-added

strategy involving the use of hospital mortality rates adjusted for sickness at admission to identify high- and low-quality hospitals. I was responsible for about 35% of the effort leading to this article. **141** citations [most recent August 2005], in cardiology, epidemiology, health services research, internal medicine, nursing, operations research, pediatrics, and statistics, in journals published in Australia, Canada, France, Germany, New Zealand, the UK and the US.) [7]

A5 Kahn K, Brook R, **Draper D**, Keeler E, Rubenstein L, Rogers W, Kosecoff J (1988). Interpreting hospital mortality data: How can we proceed? *Journal of the American Medical Association*, **260**, 3625–3628. (Discusses alternative strategies for quality of care monitoring based on mortality rates. I was responsible for about 40% of the effort leading to this article. **51** citations [most recent March 2005], in epidemiology, health services research, medical decision-making, operations research, public health, psychology, and statistics, in journals published in Germany, Singapore, the UK, and the US.) [8]

A6 Bennett C, Garfinkle J, Greenfield S, **Draper D**, Rogers W, Mathews C, Kanouse D (1989). The relation between hospital experience and in-hospital mortality for patients with AIDS-related PCP. *Journal of the American Medical Association*, **261**, 2975–2979 (with editorial comment, 3016–3017). (Demonstrates that hospitals which treat a higher volume of AIDS patients have better outcomes. I was responsible for about 50% of the effort leading to this article. **114** citations [most recent August 2005], in cardiology, family medicine, geriatrics, gerontology, internal medicine, pediatrics, and statistics, in journals published in Canada, the UK, and the US.) [9]

A7 Kahn K, Rubenstein L, **Draper D**, Kosecoff J, Rogers W, Keeler E, Brook R (1990). The effects of the DRG-based Prospective Payment System on quality of care for hospitalized Medicare patients: An introduction to the series. *Journal of the American Medical Association*, **264**, 1953–1955 (with editorial comment, 1995–1997). (This article, together with the seven that follow, summarizes the results of a five-year $7,500,000 study examining the quality of care offered to elderly patients by hospitals in the U.S. before and after a major change in governmental reimbursement method which was suspected of causing a decrease in quality of care. I wrote article 2 in the series, coauthored articles 1, 3, and 8, and edited all eight articles. **89** citations [most recent September 2005], in epidemiology, geriatrics, health policy, internal medicine, law, nursing, operations research, pharmacology, psychiatry, and statistics, in journals published in Germany, Singapore, the UK, and the US.) [11]

A8 **Draper D**, Kahn K, Reinisch E, Sherwood M, Carney M, Kosecoff J, Keeler E, Rogers W, Savitt H, Allen H, Wells K, Reboussin D, Brook R (1990). Studying the effects of the DRG-based Prospective Payment System on quality of care: Design, sampling, and fieldwork. *Journal of the American Medical Association*, **264**, 1956–1961 (with editorial comment, 1995–1997). (I had major involvement in the design and analysis of the study and was responsible for the sampling plan, which involved multi-stage cluster sampling with stratification and yielded a nationally representative data set with approximately 17,000 patients from 297 hospitals. **61** citations [most recent January 2004], in epidemiology, geriatrics, health policy, internal medicine, nursing, obstetrics, operations research, radiology, public health, and statistics, in journals published in Germany, Singapore, the UK, and the US.) [12]

A9 Keeler E, Kahn K, **Draper D**, Rogers W, Sherwood M, Rubenstein L, Reinisch E, Kosecoff J, Brook R (1990). Changes in sickness at admission following the introduction of the

Prospective Payment System. *Journal of the American Medical Association*, **264**, 1962–1968 (with editorial comment, 1995–1997). (Developed what were at the time the most accurate measures of sickness at admission to date for elderly patients with high-prevalence diseases, for use in value-added quality assessment and other quality of care activities. **122** citations [most recent September 2005], in econometrics, epidemiology, geriatrics, gerontology, health services research, internal medicine, obstetrics, operations research, orthopedics, and statistics, in journals published in Germany, Singapore, the UK, and the US.) 13

A10 Kahn K, Rogers W, Rubenstein L, Sherwood M, Reinisch E, Keeler E, **Draper D**, Kosecoff J, Brook R (1990). Measuring quality of care with explicit process criteria before and after implementation of the DRG-based Prospective Payment System. *Journal of the American Medical Association*, **264**, 1969–1973 (with editorial comment, 1995–1997). (Developed what were at the time the most extensive process criteria to date for measuring quality of hospital care explicitly. **160** citations [most recent July 2005], in biology, cardiology, geriatrics, health policy, health services research, internal medicine, oncology, pharmacology, public health, and statistics, in journals published in Germany, Singapore, the UK, and the US.) 14

A11 Rubenstein L, Kahn K, Reinisch E, Sherwood M, Rogers W, Kamberg C, **Draper D**, Brook R (1990). Changes in quality of care for five diseases as measured by implicit review, 1981 to 1986 (with editorial comment, 1995–1997). *Journal of the American Medical Association*, **264**, 1974–1979. (Shows that quality of care can also be measured accurately with expert physician judgment. **113** citations [most recent July 2005], in biology, geriatrics, health policy, health services research, internal medicine, nursing, ophthalmology, pediatrics, psychiatry, and statistics, in journals published in Germany, Singapore, the UK, and the US.) 15

A12 Kosecoff J, Kahn K, Rogers W, Reinisch E, Sherwood M, Rubenstein L, **Draper D**, Roth C, Chew C, Brook R (1990). The Prospective Payment System and impairment at discharge: The "quicker-and-sicker" story revisited. *Journal of the American Medical Association*, **264**, 1980–1983 (with editorial comment, 1995–1997). (Documents an increase in sickness at discharge after the change in the government's method for reimbursing hospitals. **133** citations [most recent July 2005], in economics, family and community health, geriatrics, health services research, internal medicine, management science, medical ethics, pharmacology, and statistics, in journals published in Germany, Singapore, the UK, and the US.) 16

A13 Kahn K, Keeler E, Sherwood M, Rogers W, **Draper D**, Bentow S, Reinisch E, Rubenstein L, Kosecoff J, Brook R (1990). Comparing outcomes of care before and after implementation of the DRG-based Prospective Payment System. *Journal of the American Medical Association*, **264**, 1984–1988 (with editorial comment, 1995–1997). (Summarizes changes in outcomes associated with the change in reimbursement mechanism. **142** citations [most recent September 2005], in economics, geriatrics, internal medicine, management science, nursing, operations research, public health, and statistics, in journals published in Germany, Singapore, the UK, and the US.) 17

A14 Rogers W, **Draper D**, Kahn K, Keeler E, Rubenstein L, Kosecoff J, Brook R (1990). Quality of care before and after implementation of the DRG-Based Prospective Payment System: A summary of effects. *Journal of the American Medical Association*, **264**, 1989–1994 (with editorial comment, 1995–1997). (Summarizes the overall effects of the change in the reimbursement system on quality of care in the U.S. from 1981 to 1986. **90** citations [most recent July

2005], in economics, epidemiology, family practice, geriatrics, health services research, internal medicine, neurology, pharmacology, social science, and statistics, in journals published in Germany, Singapore, the UK, and the US.) 18

A15 Hadorn D, **Draper D**, Rogers W, Keeler E, Brook R (1992). Cross-validation performance of patient mortality prediction models. *Statistics in Medicine*, **11**, 475–489. (Shows that mortality prediction methods are accurate enough for research involving aggregation over many patients, but not accurate enough to serve as the basis of rationing of scarce health care resources. I was responsible for about 60% of the effort leading to this article. **24** citations [most recent July 2004], in cardiology, diabetes research, ecology, epidemiology, geriatrics, health services research, internal medicine, law, oncology, operations research, pharmacology, and statistics, in journals published in the UK and the US.) 19

A16 Keeler E, Rubenstein L, Kahn K, **Draper D**, Harrison E, McGinty M, Rogers W, Brook R (1992). Hospital characteristics and quality of care. *Journal of the American Medical Association*, **268**, 1709–1714. (Documents large differences in average quality of care in the U.S. as a function of hospital characteristics such as size, urbanicity, and teaching status. I was responsible for about 35% of the effort leading to this article. **165** citations [most recent August 2005], in economics, epidemiology, geriatrics, health services research, medicine, law, nursing science, nutritional science, pharmacology, policy analysis, radiology, social science, and statistics, in journals published in Germany, Singapore, the UK, and the US.) 20

A17 **Draper D**, Hodges J, Mallows C, Pregibon D (1993). Exchangeability and data analysis (with discussion and rejoinder). *Journal of the Royal Statistical Society Series A*, **156**, 9–37. (Provides a theoretical framework for making the sorts of similarity judgments central to empirical model-building in statistics. I was responsible for about 40% of the effort leading to this article. **27** citations [most recent June 2005], in animal behavior, behavioral and brain science, economics, education, enzymology, epidemiology, evaluation methodology, health services research, medicine, political science, psychology, social science, sociology, and statistics, in journals published in the UK and the US.) 21

A18 **Draper D** (1995). Inference and hierarchical modeling in the social sciences (with discussion and rejoinder). *Journal of Educational and Behavioral Statistics*, **20**, 115–147, 233–239. (Introduces a hierarchy of inferential validity in the social sciences as a function of the strength of the data-gathering activity, and notes some interpretational and technical problems with standard methods for hierarchical modeling in meta-analysis and education policy. **31** citations [most recent August 2005], in computer science, criminology, education, epidemiology, geography, gerontology, management, medicine, operations research, psychology, public health, social work, sociology, and statistics, in journals published in Australia, China, the UK and the US.) 24

A19 **Draper D** (1995). Assessment and propagation of model uncertainty (with discussion and rejoinder). *Journal of the Royal Statistical Society, Series B*, **57**, 45–97. (A methodology article documenting the failure of standard empirical model-building methods to capture the uncertainty in the modeling process itself, and demonstrating the success of a Bayesian approach to solving the problem. **238** citations [most recent September 2005], in acoustics, agriculture, artificial intelligence, biostatistics, business, chemometrics, climate studies, computer science, dairy science, data mining, demography, ecology, econometrics, economics, education, engineering reliability, environmetrics, epidemiology, fisheries management, forestry, genetics, geostatistics, machine learning, marketing, mechanical engineering, medicine, neural networks, nuclear waste disposal, operations research, pharmacokinetics, plant pathology, plasma

physics, political science, psychology, quality assessment, queueing theory, risk analysis, sensitivity analysis, sociology, sports, statistics, toxicology, transport research, and water quality management, in journals published in Australia, Canada, China, France, the Netherlands, New Zealand, Sweden, the UK and the US.) 25

A20 Steiner A, Raube K, Stuck A, Aronow H, **Draper D**, Rubenstein L, Beck J (1996). Performance of four short scales measuring psychosocial aspects of well-being in elderly community residents. *Gerontologist*, **36**, 54–62. (Shows that well-chosen subsets of standard instruments for measuring well-being in the elderly can produce scales with good reliability and validity and reduced respondent burden. I was responsible for about 25% of the effort leading to this article. **19** citations [most recent June 2005], in community health, epidemiology, geriatrics, gerontology, health policy, neurology, pharmacology, psychology, and social welfare, in journals published in Germany, Norway, the UK and the US.) 28

A21 Swezey RL, **Draper D**, Swezey AM (1996). Bone densitometry: Comparison of dual energy X-ray absorptiometry to radiographic absorptiometry. *Journal of Rheumatology*, **23**, 1734–1738. (Lays the groundwork for a full cost-benefit analysis of three leading methods for detecting osteoporosis. I was responsible for about 45% of the effort leading to this article. **5** citations [most recent December 2003], in osteoporosis research and radiology, in journals published in France, the Netherlands, the UK and the US.) 30

A22 **Draper D** (1997). Model uncertainty in "stochastic" and "deterministic" systems. In *Proceedings of the 12th International Workshop on Statistical Modeling*, Minder C, Friedl H (eds.), Vienna: *Schriftenreihe der Österreichischen Statistichen Gesellschaft*, **5**, 43–59. (Explores a categorization of sources of uncertainty—scenario, structural, parametric, and predictive—arising in predictive modeling, and argues that in reality there is no such thing as a "deterministic" model. Citation data unavailable.) 35

A23 **Draper D**, Madigan D (1997). The scientific value of Bayesian statistical methods and outlook (with discussion). *IEEE Expert*, **12**, 18–25. (Contrasts Bayesian and non-Bayesian definitions of probability; highlights the differences in methodology and outlook that arise from these definitions; examines how MCMC has revolutionized Bayesian applied statistics, and describes some success stories; suggests that there is no need to choose exclusively between Bayesian and non-Bayesian perspectives; and outlines some possible fusions of the best of both worlds. I was responsible for about 50% of the effort leading to this article. Citation data unavailable.) 37

A24 **Draper D**, Pereira A, Prado P, Saltelli A, Cheal R, Eguilior S, Mendes B, Tarantola S (1999). Scenario and parametric uncertainty in `GESAMAC`: A methodological study in nuclear waste disposal risk assessment. *Computer Physics Communications*, **117**, 142–155. (Shows that scenario uncertainty, previously largely ignored in risk assessments in the field, accounts for more than $\frac{1}{3}$ of the overall uncertainty in attempting to assess what may happen if underground repositories for nuclear waste are compromised. I was responsible for about 80% of the effort leading to this article. **6** citations [most recent June 2003], in computer science, environmetrics, physics, and statistics, in journals published in Holland, the UK and the US.) 43

A25 Browne WJ, **Draper D** (2000). Implementation and performance issues in the Bayesian and likelihood fitting of multilevel models. *Computational Statistics*, **15**, 391–420. (Examines (a) the relative performance—in the sense of point and interval estimation accuracy—of likelihood and

Bayesian fitting methods in random-slopes regression models, and (b) some performance comparisons in random effects logistic regression models—in the sense of required CPU time to achieve a given accuracy of posterior summary—between several MCMC fitting methods, including adaptive rejection sampling and an approach we have developed specifically for `MLwiN` based on adaptive hybrid Gibbs-Metropolis sampling. I was responsible for about 50% of the effort leading to this article. **15** citations [most recent August 2005], in entomology, machine learning, medicine, psychology, and statistics, in journals published in Holland, the UK and the US.) 52

A26 **Draper D**, Fouskakis D (2000). A case study of stochastic optimization in health policy: problem formulation and preliminary results. *Journal of Global Optimization*, **18**, 399–416. (We use Bayesian decision theory to address a variable selection problem arising in attempts to indirectly measure the quality of hospital care, by comparing observed mortality rates to expected values based on patient sickness at admission. Our method weighs data collection costs against predictive accuracy to find an optimal subset of the available admission sickness variables. The approach involves maximizing expected utility across possible subsets, using Monte Carlo methods based on random division of the available data into N modeling and validation splits to approximate the expectation. After exploring the geometry of the solution space, we compare a variety of stochastic optimization methods—including genetic algorithms (GA), simulated annealing (SA), threshold acceptance (TA), messy simulated annealing (MSA), and tabu search (TS)—on their performance in finding good subsets of variables, and we clarify the role of N in the optimization. Preliminary results indicate that TS is somewhat better than TA and SA in this problem, with MSA and GA well behind the other three methods. Sensitivity analysis reveals broad stability of our conclusions. I was responsible for about 60% of the effort leading to this article. **5** citations [most recent August 2005], in artificial intelligence, medicine, and statistics, in journals published in Australia, Holland, the UK and the US.) 54

A27 Browne WJ, **Draper D**, Goldstein H, Rasbash J (2002). Bayesian and likelihood methods for fitting multilevel models with complex level–1 variation. *Computational Statistics and Data Analysis*, **39**, 203–225. (In multilevel modeling it is common practice to assume constant variance at level 1 across individuals. In this paper we consider situations where the level–1 variance depends on predictor variables. We examine two cases using a dataset from educational research; in the first case the variance at level 1 of a test score depends on a continuous "intake score" predictor, and in the second case the variance is assumed to be different for different genders. We contrast two maximum-likelihood methods based on iterative generalized least squares with two MCMC methods based on adaptive hybrid versions of the Metropolis-Hastings (MH) algorithm, and we use two simulation experiments to compare these four methods. We find that all four approaches have good repeated-sampling behavior in the classes of models we simulate. We conclude by contrasting raw- and log-scale formulations of the level–1 variance function, and we find that adaptive MH sampling is considerably more efficient than adaptive rejection sampling when the heteroscedasticity is modeled polynomially on the log scale. I was responsible for about 40% of the effort leading to this article. **3** citations [most recent August 2005], in veterinary research and statistics, in journals published in France, the UK and the US.) 57

A28 Fouskakis D, **Draper D** (2002). Stochastic optimization: a review. *International Statistical Review*, **70**, 315–349. (We review three leading stochastic optimization methods—simulated annealing, genetic algorithms, and tabu search. In each case we analyze the method, give the exact algorithm, detail advantages and disadvantages, and summarize the literature on optimal values of the inputs. As a motivating example we describe the solution—using Bayesian decision theory, via maximization of

expected utility—of a variable selection problem in generalized linear models, which arises in the cost-effective construction of a patient sickness-at-admission scale as part of an effort to measure quality of hospital care. I was responsible for about 60% of the effort leading to this article. **4** citations [most recent January 2005], in computer science, ecology, and statistics, in journals published in Holland, the UK and the US.) 59

A29 **Draper D**, Gittoes M (2004). Statistical analysis of performance indicators in UK higher education (with discussion). *Journal of the Royal Statistical Society, Series A*, **167**, 449–474 (context and discussion, 447–448, 497–499; we were not given an opportunity to rejoin). (Attempts to measure the quality with which institutions such as hospitals and universities carry out their public mandates have gained in frequency and sophistication over the last decade. In this paper we examine methods for creating performance indicators (PIs) in multilevel settings (e.g., students nested within universities) based on a dichotomous outcome variable (e.g., drop-out from the higher education system). The *profiling* methods we study involve the indirect measurement of quality, by comparing institutional outputs after adjusting for inputs, rather than directly attempting to measure the quality of the processes unfolding inside the institutions. In the context of an extended case study of the creation of PIs for universities in the UK higher education system, we (a) demonstrate the large-sample functional equivalence between a method based on indirect standardization and an approach based on fixed-effects multilevel modeling, (b) offer simulation results on the performance of the standardization method in null and non-null settings, (c) examine the sensitivity of this method to inadvertent omission of relevant input variables, (d) explore random-effects reformulations and characterize settings in which they are preferable to fixed-effects multilevel modeling in this type of quality assessment, and (e) discuss extensions to longitudinal quality modeling and the overall pros and cons of institutional profiling. Our results are couched in the language of higher education but apply with equal force to other settings with dichotomous response variables, such as the examination of observed and expected rates of mortality (or other adverse outcomes) in the study of the quality of health care. I was responsible for about 65% of the effort leading to this article. **1** citation [December 2004], in statistics, in a journal published in the UK.) 61

A30 Hanks B, McDowell C, **Draper D**, Krnjajić M (2004). Program quality with pair programming in CS1. *ACM SIGCSE Bulletin*, **36**, 176–180. (Pair programming transforms what has traditionally been a solitary activity into a cooperative effort. While pair programming, two software developers (the *driver* and the *navigator*, roles which are switched at regular intervals) share a single computer monitor and keyboard. Prior research has shown that compared with students who work alone, students who pair demonstrate increased confidence in their work, and greater success in their first computer science class (CS1); however, these earlier studies were flawed in that paired and solo students were not given the same programming assignments. We use a design that holds assignments constant, and we employ Bayesian methods to quantify the improvement in both process and outcome measures of program quality under pair programming in our stronger experimental design. I was responsible for about 40% of the effort leading to this article. Citation data unavailable.) 62

A31 Browne WJ, **Draper D**. A comparison of Bayesian and likelihood methods for fitting multilevel models. *Bayesian Analysis*, forthcoming. (Demonstrates that Bayesian MCMC-based estimation outperforms likelihood and quasi-likelihood methods in variance components and random-effects logistic regression models with respect to bias of point estimates and coverage and length of interval estimates, and therefore recommends the use of maximum likelihood estimation during the model exploration phase of a multilevel study (for computational speed), and Bayesian estimation using MCMC to produce

final publishable results. I was responsible for about 50% of the effort leading to this article.) 64

A32 Fouskakis D, **Draper D**. Stochastic optimization methods for cost-effective quality assessment in health (submitted; 53 pages). (Uses Bayesian decision theory to solve the general problem of variable selection in generalized linear models subject to a data collection cost constraint on the predictor variables. The particular case study in which this methodology is developed involves the creation of a cost-effective scale for measuring sickness at admission for hospital patients. We use simulated annealing (SA), genetic algorithms (GA), and tabu search (TS) to find (near-)optimal subsets of predictor variables; the optimization is of a real-valued function of binary $(s_1, \ldots, s_p)$, and in our largest application the space of s-vectors over which we search has $2^{83} \doteq 10^{25}$ elements. We use simulation methods to explore a wide variety of user-defined input settings for the optimization methods we examine, without tuning these methods specifically to the structure of our utility-maximization problem, and we also create a context-specific version (ISA) of simulated annealing (the optimization method whose generic implementation performed most poorly) and document the improvement over its generic counterpart. We find in our optimization problem that (a) when p is modest (i) genetic algorithms performed relatively poorly for all but the very best user-defined input configurations, and generic simulated annealing also did not perform well, whereas (ii) tabu search had excellent median performance and was much less sensitive to suboptimal choice of user-defined inputs; and (b) for large p the best versions of GA and ISA outperformed TS and generic SA. Our results are phrased in the language of health policy but apply with equal force to other quality assessment settings with dichotomous outcomes, such as the examination of drop-out rates in education, the study of retention rates in the workplace and the creation of cost-effective credit scores in business. This work (1) provides a relatively new perspective on variable selection in generalized linear models, (2) offers new insights into the comparative advantages and flaws of competing stochastic optimization methods, and (3) produces results of direct potential use in quality assessment in health policy and other fields. I was responsible for about 50% of the effort leading to this article.) 68

A33 **Draper D**. On the relationship between model uncertainty and inferential/predictive uncertainty (submitted; 10 pages). (Demonstrates that increasing the uncertainty in the modeling process by expanding a model hierarchically can lead either to an increase or a decrease in uncertainty about quantities of direct inferential or predictive interest.) 69

A34 **Draper D**, Toland JF. Nonparametric prior specification (submitted; 36 pages). (Shows how to use techniques from functional analysis to compute bounds on Bayes factors in an infinite-dimensional class of prior distributions, as a way to deal more realistically with uncertainty in the process of specifying priors. I was responsible for about 50% of the effort leading to this article.) 70

A35 **Draper D**, Krnjajić M. Bayesian model specification (submitted; 30 pages). (A standard (data-analytic) approach to statistical model specification, practiced with equal vigor in both Bayesian and non-Bayesian approaches to model-building, involves the initial choice, for the structure of the model, of one or another of a variety of standard parametric families, followed by modification of this initial choice - once data begin to arrive - if the data suggest deficiencies in the original specification. In this paper (a) we argue that this approach is formally incoherent, because it amounts to using the data both to specify the prior distribution on structure space and to update using this data-determined prior; (b) we identify two approaches to avoiding (at least in principle, and with a fair amount of data) the incoherence in (a): (1) Bayesian semi-parametric modeling and (2) three-way out-of-sample predictive validation; (c) we provide details on implementing (2); (d) we argue that to make progress in coherent Bayesian model specification in complicated problems You (the modeler) have to either implicitly or explicitly choose a

utility structure which defines, for You, when the model currently being examined is "good enough"; (e) we argue that it is best to make this choice explicitly on the basis of real-world considerations regarding the use to which the model will be put; and (f) we contrast model selection methods based on the log score and deviance information criteria (DIC) as two examples of (e) with utilities governed by predictive accuracy. I was responsible for about 50% of the effort leading to this article.) 71

Letters (Refereed)

These are short research contributions, e.g., in medical journals.

L1 Dubois R, Rogers W, **Draper D**, Brook R (1988). Does hospital mortality predict quality? *New England Journal of Medicine*, **318**, 1624. (A further exploration of the relationship between inpatient mortality and hospital quality. I was responsible for about 25% of the effort leading to this letter. Citation data unavailable.) 4

L2 Bennett C, **Draper D**, Kanouse D, Greenfield S (1989). AIDS treatment center: is the concept premature? *Journal of the American Medical Association*, **262**, 2537. (Discusses whether (in 1989) it was clinically appropriate for hospitals to create treatment centers dedicated solely to treating HIV and AIDS patients. I was responsible for about 25% of the effort leading to this letter. Citation data unavailable.) 10

Chapters in Books

BC1 **Draper D**, Bowater R (1999). Sampling errors under non-probability sampling. Chapter 4 in *Model Quality Reports in Business Statistics*, by Bergdahl M, Black O, Bowater R, Chambers R, Davies P, Draper D, Elvers E, Full S, Holmes D, Lundqvist P, Lundström S, Nordberg L, Perry J, Pont M, Prestwood M, Richardson I, Skinner C, Smith P, Underwood C, Williams M; Luxembourg: Eurostat, Volume I, 65–81. (Examines a variety of non-probability-based sampling methods in routine use in business surveys, including voluntary sampling, quota sampling, judgmental sampling, and cut-off sampling, and makes recommendations on best practice in assessing the biases that can arise with these methods. I was responsible for about 80% of the effort leading to this book chapter. Citation data unavailable.) 46

BC2 **Draper D**, Bowater R (1999). Model assumption errors. Chapter 9 in *Model Quality Reports in Business Statistics*, by Bergdahl M, Black O, Bowater R, Chambers R, Davies P, Draper D, Elvers E, Full S, Holmes D, Lundqvist P, Lundström S, Nordberg L, Perry J, Pont M, Prestwood M, Richardson I, Skinner C, Smith P, Underwood C, Williams M; Luxembourg: Eurostat, Volume I, 138–162. (Examines a number of areas of sample survey design and analysis in which statistical models feature prominently, including index formulae, benchmarking, seasonal adjustment, cut-off sampling, small-area estimation, and non-ignorable nonresponse, and makes recommendations on best practice in assessing what can happen when assumptions in these models are wrong. I was responsible for about 80% of the effort leading to this book chapter. Citation data unavailable.) 47

BC3 **Draper D**, Saltelli A, Tarantola S, Prado P (2000). Scenario and parametric sensitivity and uncertainty analyses in nuclear waste disposal risk assessment: the case of GESAMAC. Chapter 13 in *Mathematical and Statistical Methods for Sensitivity Analysis* (Saltelli A, Chan K, Scott M, eds.), New York: Wiley, 275–292. (Shows that variance-based sensitivity analyses are not fully adequate in determining the factors most responsible for high radiologic doses arising from the failure of underground storage facilities for nuclear waste, and that about 30% of the overall predictive uncertainty for log dose arises from uncertainty about the scenario describing how the facility will fail—a source of uncertainty previously largely ignored or treated qualitatively. Also explores the use of projection pursuit regression in sensitivity analysis. I was responsible for about 90% of the effort leading to this book chapter. Citation data unavailable.) 55

BC4 **Draper D** (2006). Bayesian multilevel analysis and MCMC. Chapter 3 in *Handbook of Quantitative Multilevel Analysis* (de Leeuw J, editor), New York: Springer (59 pages), forthcoming. (My goal in writing this chapter was to produce a definitive introduction to the Bayesian paradigm and how it is applied in contemporary statistical work to the analysis of multilevel, or hierarchical, models, using Markov chain Monte Carlo methods as the basis of computation. Citation data unavailable.) 66

Book Reviews

BR1 **Draper D** (1987). Review of *Summing Up: The Science of Reviewing Research*, by R Light and D Pillemer, Cambridge MA: Harvard University Press (1984). *Journal of the American Statistical Association*, **82**, 349–350. (Critique of a leading book on meta-analysis in education and medicine. Citation data unavailable.) 3

BR2 Fouskakis D, **Draper D** (1999). Review of *Tabu Search*, by F Glover and M Laguna, Amsterdam: Kluwer (1997). *The Statistician*, **48**, 616–619. (Critique of a book on a popular stochastic optimization method written by the method's developers. I was responsible for about 60% of the effort leading to this book review. Citation data unavailable.) 45

Other

In the field of statistics it is an honor (a) to serve as an invited discussant of other people's articles in leading journals (particularly to play the role of proposer or seconder of the vote of thanks at discussion meetings of the *Royal Statistical Society*) and (b) to be invited to write entries in encyclopedias, and such contributions are influential in their own right: discussion plays an important part in the exchange of ideas in statistics.

DE1 **Draper D** (1987). On exchangeability judgments in predictive modeling, and the role of data in statistical research. *Statistical Science*, **2**, 454–461 (discussion of "Prediction of Future Observations in Growth Curve Models," by CR Rao). (An indictment of the misuse of "real data" in methodological work in statistics, and a call for greater explicitness in laying out the similarity judgments at the heart of good predictive modeling. Citation data on discussion unavailable; article under discussion cited **19** times.) 2

DE2 **Draper D**, Mallows C (1993). Discussion of "Predictability and prediction," by ASC Ehrenberg and JA Bound, *Journal of the Royal Statistical Society Series A*, **156**, 201–202. (A reply to comments made by Ehrenberg and Bound on Draper et al. (1993). I was responsible for about 50% of the effort leading to this discussion. Citation data on discussion unavailable; article under discussion cited **15** times.) 22

DE3 **Draper D** (1995). Discussion of "Fractional Bayes factors for model comparison," by A O'Hagan, *Journal of the Royal Statistical Society Series B*, **57**, 124. (Remarks on the use and calculation of Bayes factors in prediction. Citation data on discussion unavailable; article under discussion cited **138** times.) 26

DE4 **Draper D** (1995). Discussion of "Model uncertainty, data mining, and statistical inference," by C Chatfield, *Journal of the Royal Statistical Society Series A*, **158**, 450–451. (Provides an example of model uncertainty arising from variable selection in regression in which jackknifing the modeling process improves predictive calibration. Citation data on discussion unavailable; article under discussion cited **160** times.) 27

DE5 **Draper D** (1996). Utility, sensitivity analysis, and cross-validation in Bayesian model-checking. *Statistica Sinica*, **6**, 760–767 (discussion of "Posterior predictive assessment of model fitness via realized discrepancies," by A Gelman, X-L Meng, and H Stern). (Advocates graphical summaries of model deficiencies followed by hierarchical embedding of a candidate model in a richer family based on the nature of its shortcomings, and out-of-sample predictive calibration as a way to avoid using the data twice in model selection. **5** citations [most recent February 2003], in machine learning, medicine, and statistics, in journals published in Canada, the UK and the US; article under discussion cited **171** times.) 29

DE6 **Draper D** (1996). Discussion of "Testing for mixtures: A Bayesian entropic approach," by KL Mengersen and CP Robert. In *Bayesian Statistics 5*, JM Bernardo, J Berger, P Dawid, and AFM Smith, eds., Oxford: Oxford University Press, 270. (Advocates the explicit quantification of utility, in preference to a reliance on generic loss functions, in problems of stochastic model choice. Citation data unavailable.) 31

DE7 **Draper D** (1996). Discussion of "Accounting for model uncertainty in survival analysis improves predictive performance," by AE Raftery, D Madigan, and CT Volinsky. In *Bayesian Statistics 5*, JM Bernardo, J Berger, P Dawid, and AFM Smith, eds., Oxford: Oxford University Press, 341–342. (Discusses how to measure the effects of model uncertainty in more practically relevant ways, and advocates treating variable selection uncertainty continuously rather than discretely. Citation data unavailable.) 32

DE8 **Draper D** (1996). Discussion of "League tables and their limitations: Statistical issues in comparisons of institutional performance," by H Goldstein and DJ Spiegelhalter, *Journal of the Royal Statistical Society Series A*, **159**, 416–418. (Stresses the need for process evaluations of quality to supplement examination of system outputs adjusted for inputs, discusses hierarchical models and priors alternative to those proposed by the authors, and emphasizes the need for predictive validation in HM work. Citation data on discussion unavailable; article under discussion cited **185** times.) 33

DE9 **Draper D** (1996). Discussion of "Hierarchical generalized linear models," by Y Lee and JA Nelder, *Journal of the Royal Statistical Society Series B*, **58**, 662–663. (Demonstrates

that the authors' approach to hierarchical modeling is dominated by full-Bayes analyses using MCMC methods. Citation data on discussion unavailable; article under discussion cited **148** times.) [34]

DE10 **Draper D** (1997). Discussion of "The EM algorithm: An old song sung to a fast new tune," by X-L Meng and D Van Dyke, *Journal of the Royal Statistical Society Series B*, **59**, 552–553. (Describes a strategy for general-purpose Metropolis sampling, and questions the future of EM in an MCMC world. Citation data on discussion unavailable; article under discussion cited **108** times.) [36]

DE11 Greenland S, **Draper D** (1998). Exchangeability. Entry in *Encyclopedia of Biostatistics*. Armitage P, Colton T (eds). London: Wiley. (Defines unconditional and conditional exchangeability and discusses difficulties in applying de Finetti's representation theorems in practice. Citation data unavailable.) [38]

DE12 **Draper D** (1998). Discussion of "Model-based inference for categorical survey data subject to nonignorable nonresponse," by JJ Forster and PWF Smith, and "Analysis of longitudinal binary data from multiphase sampling," by D Clayton, G Dunn, A Pickles, and D Spiegelhalter, *Journal of the Royal Statistical Society Series B*, **60**, 94 (Advocates predictive validation as a method for tuning prior distributions, especially in situations in which strong prior assumptions are unchallenged by the data, and questions the role of estimated versus known sampling weights in survey methods based on inverse probability weighting. Citation data on discussion unavailable; articles under discussion cited **26** and **17** times, respectively.) [39]

DE13 **Draper D** (1998). Bayesian analysis of finite-population survey data using Markov Chain Monte Carlo. Closing discussion, Half-Day Meeting on Design and Analysis of Complex Sample Surveys, *Journal of the Royal Statistical Society Series B*, **60**, 96–98 (Lays out and illustrates a Bayesian theory of finite-population sampling based on MCMC imputation of the unsampled units as missing data. Citation data unavailable.) [41]

DE14 **Draper D** (1998). Discussion of "Some algebra and geometry for hierarchical models, applied to diagnostics," by JS Hodges, *Journal of the Royal Statistical Society Series B*, **60**, 527–528 (Argues for the use of predictive rather than inferential diagnostics for hierarchical models. Citation data on discussion unavailable; article under discussion cited **22** times.) [42]

DE15 **Draper D** (1999). Discussion (seconder of the vote of thanks) of "Some statistical heresies," by JK Lindsey, *Journal of the Royal Statistical Society Series D—The Statistician*, **48**, 27–28 (Argues for a combination of Bayesian and non-Bayesian outlook and methods in which out-of-sample predictive validation is used to calibrate Bayesian results. Citation data unavailable.) [44]

DE16 **Draper D** (1999). Discussion (proposer of the vote of thanks) of "Bayesian nonparametric inference for random distributions and related functions," by SG Walker, P Damien, PW Laud, and AFM Smith, *Journal of the Royal Statistical Society Series B*, **61**, 510–513. (Emphasizes the importance of Bayesian nonparametrics as the way to finally make operational de Finetti's representation theorem for continuous outcomes, illustrates some of the finer points in using Pólya trees, and makes a connection between Pólya trees and wavelet density estimation. Citation data on discussion unavailable; article under discussion cited **25** times.) [48]

DE17 **Draper D** (1999). Discussion of "Decision models in screening for breast cancer," by G Parmigiani. In *Bayesian Statistics 6*, JM Bernardo, J Berger, P Dawid, and AFM Smith, eds., Oxford: Oxford University Press, 541–543. (Attempts to bring the results of an expected utility analysis onto a more interpretable scale for women choosing whether, and how often, to be screened. Citation data unavailable.) [49]

DE18 **Draper D** (1999). Model uncertainty yes, discrete model averaging maybe. *Statistical Science*, **14**, 405–409 (discussion of "Bayesian model averaging: a tutorial," by Hoeting JA, Madigan D, Raftery AE, Volinsky CT). (Argues that variable selection uncertainty in generalized linear models should be dealt with in a continuous manner via hierarchical modeling rather than through discrete model averaging, and advocates the use of expected utility maximization as a basis for model choice. Citation data on discussion unavailable; article under discussion cited **129** times.) [51]

DE19 **Draper D** (2002). Discussion of "Commissioned analysis of surgical performance by using routine data: lessons from the Bristol inquiry," by DJ Spiegelhalter, P Aylin, NG Best, SJW Evans, and GD Murray, *Journal of the Royal Statistical Society Series A*, **165**, 227. (Emphasizes the value of simulation studies and Bayesian decision theory as a basis for setting practical cutpoints to identify "good" and "bad" institutions in input-output quality assessment. Citation data on discussion unavailable; article under discussion cited **7** times.) [56]

DE20 **Draper D** (2002). Discussion of "Bayesian measures of model complexity and fit," by DJ Spiegelhalter, NG Best, BP Carlin, and A van der Linde, *Journal of the Royal Statistical Society Series B*, **64**, 630–631. (Criticizes the view taken by the authors that model choice can be made in a context-free manner, and advocates a decision-theoretic basis for model selection based on maximization of expected utility. Citation data on discussion unavailable; article under discussion cited **151** times.) [58]

DE21 **Draper D** (2004). Discussion of "Ecological inference for 2×2 tables," by J Wakefield, *Journal of the Royal Statistical Society Series A*, **167**, 435–436. (Emphasizes how violently sensitive inferential answers at the individual level are to assumptions and prior inputs when all that is available is aggregate data, and discusses the relationship between sampling-theory and model-based approaches to ecological inference. Citation data on discussion unavailable; article under discussion cited **3** times.) [60]

DE22 **Draper D** (2005). Discussion of "Multiple bias modeling for analysis of observational data," by S Greenland, *Journal of the Royal Statistical Society Series A*, **168**, 301. (Offers suggestions on how to perform both process and outcome evaluation of the method proposed by Greenland to judgmentally estimate variance components (a) for nonexchangeability between the observed units in an observational study and units in the population of real scientific interest and (b) for the effects of unmeasured confounders in such studies. Citation data on discussion unavailable; article under discussion cited **5** times.) [63]

DE23 **Draper D** (2005). Discussion of "Local model uncertainty and incomplete-data bias," by Copas J and Eguchi S, *Journal of the Royal Statistical Society Series B*, **67**, 502–503. (Comments upon differences between frequentist and Bayesian approaches to accounting for model uncertainty, and discusses the use of random-effects meta-analytic models to create uncertainty bands that appropriately reflect bias in the measurement process, using estimation of the speed of light in physics in the 20th century as an example. Citation data unavailable.) [65]

DE24 **Draper D** (2006). Coherence and calibration: comments on subjectivity and "objectivity" in Bayesian analysis. Discussion of "The case for objective Bayesian analysis" by Berger J and "Subjective Bayesian analysis: principles and practice," by Goldstein M, *Bayesian Analysis*, forthcoming (4 pages). (Examines the crucial role of both coherence and calibration in Bayesian analysis, and argues (a) that all Bayesian work is inherently subjective but that (b) "objective" prior distributions play a valuable role in achieving good calibration when (in your judgment) the past and future are exchangeable.) 67

UNIVERSITY SERVICE

Department of Applied Mathematics and Statistics

I have served as the founding Chair of the Department of Applied Mathematics and Statistics (AMS) since arriving at UCSC in Jan 2001. Quite apart from research and teaching obligations, until recently this has been virtually a full-time job in itself: since I had only two AMS colleagues when I arrived (one of them junior), almost all of the administrative responsibilities for the Department fell to me from Jan 2001 through Sep 2003, and many such responsibilities are still mine today despite a growing faculty and vigorous efforts on my part to spread the burden. Specific accomplishments since Jan 2001 have included, but have not been limited to, the following.

2000–01
- In Jan 2001 I managed *personnel actions* for my two AMS colleagues (N Balmforth and H Wang) and set the *AMS curriculum plan* for 2001–02.
- From Jan to May 2001 I organized the successful *recruiting* of two new statisticians (R Prado and B Sansó); this involved (among other things) serving as Chair of the Search Committee, creating a long-list of 15 candidates from 107 applications, selecting a short-list of 6 candidates, managing four-day visits by each of the 6 candidates, and negotiating with the two successful candidates.
- From Jan to Sep 2001 I worked closely with two successive Chairs of the Department of Mathematics to begin *curriculum coordination*, and in May 2001 I played an active part in the Mathematics Department *external review*.
- From Jan 2001 to Sep 2002 I served as the *AMS web officer* (this involved creating and updating the initial AMS web pages).

2001–02
- In autumn 2001 I set the *AMS curriculum plan* for 2002–03; curriculum coordination with the Department of Mathematics continued. In spring 2002 joint curriculum planning with the Department of Economics began.
- From Jan to May 2002 I organized the successful *recruiting* of two new statisticians (A Kottas and H Lee); this involved (among other things) serving as Chair of the Search Committee, creating a long-list of 20 candidates from 114 applications, selecting a short-list of 8 candidates, managing four-day visits by each of the 8 candidates, and negotiating with the two successful candidates.

– In autumn 2002 I managed *personnel actions* for two of my AMS colleagues (M Mangel and R Prado) and set the *AMS curriculum plan* for 2003–04; curriculum coordination with the Departments of Mathematics and Economics continued. In spring 2003 joint curriculum planning with the Department of Psychology began.

2002–03 – In autumn 2002 I set the *AMS curriculum plan* for 2003–04; curriculum coordination with the Departments of Economics and Mathematics continued.

– In spring 2003 joint curriculum planning with the Department of Environmental Toxicology began.

2003–04 – In autumn 2003 I managed *personnel actions* for two of my AMS colleagues (A Kottas and H Lee) and set the *AMS curriculum plan* for 2004–05; curriculum coordination with the Departments of Mathematics and Economics continued.

– In 2003–04 I served on the School of Engineering Committee on Academic Personnel and the Undergraduate Studies Committee.

– From Jan to Apr 2004 I organized the successful *recruiting* of a new senior statistician (B Sansó); this involved (among other things) serving as Chair of the Search Committee, selecting a short-list of 3 candidates from 45 applications, managing four-day visits by each of the 3 candidates, and negotiating with the successful candidate. I also played an active role in the successful recruiting of two new junior applied mathematicians (P Garaud and J Cortés); this involved detailed discussions with four candidates and negotiating with the two successful candidates.

– In the summer of 2004 I compiled the *AMS Annual Report* for 2003–04 (this is available in PDF format in Section V. at `www.ams.ucsc.edu/~draper/writings.html`).

2004–05 – In autumn 2004 I managed a *personnel action* for one of my AMS colleagues (R Prado), participated in a personnel action for another of my AMS colleagues (H Wang), and set the *AMS curriculum plan* for 2005–06; curriculum coordination with the Departments of Mathematics and Economics continued, and curriculum coordination with the Departments of Ecology and Evolutionary Biology, Environmental Studies, and Molecular, Cell, and Developmental Biology began.

– In winter and spring 2005, after consultations with many relevant people, I finished a complete rewrite of the *AMS Graduate Program Proposal*; this proposal is now under review by the campus Graduate Council, and will be submitted to the University of California Office of the President as soon as possible.

– In the summer of 2005 I compiled the *AMS Annual Report* for 2004–05 and began work on the AMS contribution to the latest UCSC long-range planning exercise.

Baskin School of Engineering

- Chair, *Engineering School Space Committee*, Jan 2001–present (this has involved working closely with Assistant Dean Jim Genes to ensure that all space needs of the Engineering School are addressed as well as they can be given space constraints).

- Chair, *Engineering School Recruitment Committee*, June 2001–May 2002 (this involved coordinating and streamlining school-wide recruitment efforts to ensure that all relevant deadlines are met and strong pools of candidates are found).

- Member, *Engineering School Graduate Committee*, Jan 2001–Sep 2002 (this has involved working with the other Engineering departments on graduate course development and recruiting of graduate students; one result was the recruiting of AMS's first Ph.D. student, S Liu).

- Member, *Engineering School Undergraduate Committee*, Jan 2001–2002 (this has involved working with the other Engineering departments on undergraduate course development and serving as liaison between AMS and all Engineering school undergraduate majors).

- From Mar through Sep 2001 I wrote the AMS contribution to the *Engineering School 10–year plan*, and in Feb 2003 I wrote the AMS *3–year hiring plan*.

- Member, *Dean's Undergraduate Student Advisory Council*, Oct 2002–present; member, *Engineering 2 Building Committee*, Oct 2002–present; member, *Alterations III Planning Committee*, Oct 2002–present.

- From Dec 2003 through Feb 2004 I wrote the AMS contribution to the *Engineering School strategic futures plan for 2020*.

- From March 2004 to the present I have served on the Engineering School's *Executive Budget Committee*, which is responsible for advising the Dean of Engineering on how to absorb the 2004 budget cuts in a way that does the least harm.

Other

- From 1993 to 1996 I was Seminar Chair for the Statistics Group at the University of Bath, responsible for arranging seminars by visitors approximately seven times per term. During this period a number of prominent statisticians visited Bath to give talks, including A Agresti, A Atkinson, G Barnard, J Copas, DR Cox, H Daniels, A Dempster, P Dawid, D Freedman, J Friedman, W Gilks, T Hastie, J Kingman, J Nelder, B Silverman, and D Spiegelhalter.

- From 1995 to 2000 I acted as External Examiner for two Ph.D. students in the UK (K Vines, University of Cambridge, advisor W Gilks; R Bowater, University of Bristol, advisor B Silverman) and Internal Examiner at the University of Bath for one Ph.D. student (J Hollyer, advisor C Jennison).

- From August 1999 to December 2000 I was Head of the Statistics Group at the University of Bath, responsible for the academic well-being of 11 faculty, 4 postdoctoral Research Officers, and 12 PhD students.

OUTSIDE PROFESSIONAL ACTIVITIES

Public Lecture or Forum Participation

From 1994 to the present I have given the following **research short courses** to a total of about 1,800 participants.

SC1 *Lectures on Bayesian Statistics*: University of Bern, 1994 (2–day course, 8 hours lecturing, 75 attendees).

SC2 *Bayesian Hierarchical Modeling*: American Statistical Association annual meetings, Anaheim CA, Aug 1997; (award-winning 1–day course, 6 hours lecturing, 52 attendees; average overall effectiveness score 92% based on 40 participant evaluations);

SC3 *MCMC Methods in Multilevel Modeling*: Institute of Education, University of London, 1998 (1–day course, given twice (Apr, Oct); 6 hours lecturing; joint with W Browne, 37 attendees).

SC4 *Introductory, Intermediate and Advanced Bayesian Hierarchical Modeling*: American Statistical Association annual meeting, Dallas TX, Aug 1998 (2–day course: 6 hours lecturing, 97 total attendees; average overall effectiveness score 93% based on 88 participant evaluations).

SC5 *Bayesian Hierarchical Modeling*: 32nd Symposium on the Interface: Computing Science and Statistics, New Orleans LA, 2000 (1–day course; 53 attendees);

SC6 *Bayesian Hierarchical Modeling*: Pfizer UK Ltd, Sandwich, England, 2000 (2–day course; 20 attendees);

SC7 *Bayesian Hierarchical Modeling*: 7th School of Linear Models, São Carlos, Brazil, Jan 2001 (1–day course; 65 attendees).

SC8 *Hierarchical Modeling for Profiling in Health and Education*, International Conference on Health Policy Research, Boston MA, Dec 2001 ($\frac{1}{2}$-day course: 4 hours lecturing; 111 attendees).

SC9 *Bayesian Hierarchical Modeling*: 27th Annual Summer Institute of Applied Statistics, Brigham-Young University, Provo UT, Jun 2002 (3–day course: 18 hours lecturing; 49 attendees).

SC10 *Bayesian and Likelihood-Based Methods in Multilevel Modeling*: EpiCentre, Massey University, Palmerston North, New Zealand, Dec 2002 (3–day course: 20 hours lecturing; joint with W Browne, 35 attendees).

SC11 *Intermediate/Advanced Bayesian Hierarchical Modeling*: American Statistical Association annual meeting, San Francisco CA, Aug 2003 (1–day course: 6 hours lecturing, 50 attendees; average overall effectiveness score 98% based on 43 participant evaluations).

SC12 *Bayesian Inference and Hierarchical Modeling*: U.S. Centers for Disease Control and Prevention, Atlanta GA, Nov 2003 (2–day course: 12 hours lecturing, 40 attendees).

SC13 *Intermediate/Advanced Bayesian Hierarchical Modeling*: American Statistical Association LearnSTAT Program, Alexandria VA, Mar 2004 (1–day course: 6 hours lecturing, 39 attendees).

SC14 *Bayesian Modeling, Inference and Prediction*: Philadelphia Chapter, American Statistical Association, Philadelphia PA, July 2004 (1–day course: 6.5 hours lecturing, 120 attendees).

SC15 *Bayesian Modeling, Inference and Prediction*: Pratt & Whitney, East Hartford CT, July 2004 (1–day course: 6.5 hours lecturing, 24 attendees).

SC16 *Intermediate/Advanced Bayesian Hierarchical Modeling*: American Statistical Association annual meeting, Toronto ON, Aug 2004 (1–day course: 6 hours lecturing, 54 attendees; average overall effectiveness score 92% based on 50 participant evaluations).

SC17 *Bayesian Inference, Prediction and Decision-Making, With Applications to Risk Assessment*: National Veterinary and Food Research Institute of Finland, Helsinki, Oct 2004 (5-day course: 30 hours lecturing and computer lab work, 41 attendees).

SC18 *Bayesian Statistical Methods and Hierarchical Modeling*: Division of Research, Northern California Kaiser Permanente, Oakland CA, Oct-Dec 2004 (10-week course: 20 hours lecturing and computer lab work, 42 attendees).

SC19 *Bayesian Modeling, Inference and Prediction*: Biological Sciences, University of California, Berkeley, Berkeley CA, Dec 2004 (1–day course: 6.5 hours lecturing, 138 attendees).

SC20 *Concepts, Trends and Applications of Frequentist and Bayesian Statistics in the Healthcare and Pharmaceutical Industries*: Aventis Pharmaceuticals, Somerset NJ, Dec 2004 (1–day course: 6.5 hours lecturing, 28 attendees).

SC21 *Bayesian Modeling, Inference and Prediction*: Boston Chapter, American Statistical Association, Cambridge MA, Dec 2004 (1–day course: 6.5 hours lecturing, 153 attendees).

SC22 *Bayesian Model Specification and Hierarchical Modeling*: International Conference on Bayesian Statistics and Its Applications, Banaras Hindu University, Varanasi, India, Jan 2005 ($\frac{1}{2}$-day course: 3 hours lecturing, 110 attendees).

SC23 *Bayesian Modeling, Inference and Prediction*: Chicago Chapter, American Statistical Association, Cambridge MA, Mar 2005 (1–day course: 6.5 hours lecturing, 221 attendees).

SC24 *Intermediate Bayesian Modeling, With Applications in Ecology*: Purdue University, West Lafayette IN, Mar 2005 (1–day course: 6.5 hours lecturing, 16 attendees).

SC25 *Practical Bayesian Nonparametric Methods*: 30th Annual Summer Institute of Applied Statistics, Brigham-Young University, Provo UT, Jun 2005 (3–day course: 13 hours lecturing, joint with Thanasis Kottas; 40 attendees).

SC26 *Bayesian hierarchical modeling, with applications to provider profiling*: 2005 International Conference on Health Policy Research, Boston MA, Oct 2005 (0.5–day course: 4 hours lecturing, 83 attendees).

Membership and Activities in Professional Associations

- Member, Institute of Mathematical Statistics (1981–present), American Statistical Association (1981–present), and Biometric Society (1984–present).
- Member, American Statistical Association award committee, W.J. Youden Prize, 1994–2000.
- Member, Nominations Committee, *International Society for Bayesian Analysis*, 1998–2000.

Papers Presented at Professional Meetings

In the interests of brevity I list only invited, special invited, and plenary talks at major international meetings since Dec 1993:

IT1 *Hierarchical modeling and model uncertainty.* Invited talk, International Workshop on Hierarchical Modeling, 6–10 December 1993, Rio de Janeiro, Brazil.

IT2 *Bayesian model selection.* Invited talk, International Meeting on Model Selection, 13–19 December 1993, Oberwolfach, Germany.

IT3 *Assessment and propagation of model uncertainty.* Invited talks, International Workshop on Bayesian Modeling, 2–4 June 1994, Madrid, and meeting of the International Society of Bayesian Analysis, 5–12 June 1994, Alicante, Spain.

IT4 *Bayesian model uncertainty in generalized linear models.* Invited talk, European Meeting of Statisticians, 20–25 August 1995, Aarhus, Denmark.

IT5 *Causal inference via Markov chain Monte Carlo.* Invited talk, Joint Statistical Meetings, 3–8 August 1996, Chicago, USA.

IT6 *Bayesian analysis of econometric selection models in causal inference.* Invited talk, Royal Statistical Society Research Conference, 4–8 September 1996, Guildford, England.

IT7 *Bayesian model uncertainty.* Invited talk, International Workshop on Stochastic Modeling in Meteorology, Isaac Newton Institute, 31 October–2 November 1996, Cambridge, England.

IT8 *Bayesian methods in the social sciences.* Invited talk, International Meeting on Statistics in the Social Sciences, Nuffield College, 14–16 November 1996, Oxford, England.

IT9 *Model uncertainty in "stochastic" and "deterministic" systems.* Special invited talk, International Workshop on Statistical Modeling, 5–9 July 1997, Biel, Switzerland.

IT10 *Topics in Bayesian nonparametrics.* Two invited talks, Highly Structured Stochastic Systems (HSSS) International Workshop on Variable-Dimension MCMC Methods, 21–24 September 1997, Southampton, England.

IT11 *The Bayesian approach to model uncertainty: methods and applications.* Invited talk, International Conference on Sensitivity Analysis of Model Output (SAMO98), 16–21 April 1998, Venice, Italy.

IT12 *Stochastic optimization methods for cost-effective quality assessment in health.* Invited talk, Joint Statistical Meetings, 8–13 August 1998, Dallas, USA.

IT13 *Fixing the broken bootstrap: Bayesian nonparametric inference with highly skewed and heavy-tailed data.* Invited talks, International Statistical Symposium, 15–17 August 1998, Taipei, Taiwan, and 4th Conference of the International Chinese Statistical Association, 19–21 August 1998, Kunming, China.

IT14 *Bayesian causal inference.* Special invited talk, Royal Statistical Society Research Conference, 8–11 September 1998, Glasgow, Scotland.

IT15 *Bayesian nonparametric analysis in nuclear waste disposal risk assessment.* Invited talk, Highly Structured Stochastic Systems (HSSS) International Workshop on Graphical Modeling, 13–18 September 1998, Tirano, Italy.

IT16 *Applications of Pólya trees.* Invited talk, International Workshop on Statistical Modeling, Isaac Newton Institute, 7–11 December 1998, Cambridge, England.

IT17 *A comparison of Bayesian and likelihood methods for fitting multilevel models.* Special invited talk, International Meeting on Multilevel Modeling, 29–31 March 1999, Amsterdam, Holland.

IT18 *Nonparametric prior specification.* Invited talk, International Workshop on Bayesian Nonparametric Methods, 23–28 July 1999, Reading, England.

IT19 *Hierarchical modeling, variable selection, and utility.* Plenary talk, 3rd European Conference on Principles and Practice of Knowledge Discovery in Databases (PKDD '99), 15–18 September 1999, Prague.

IT20 *Scenario and parametric uncertainty in* ***GESAMAC****: a methodological study in nuclear waste disposal risk assessment.* Invited talk, Interface 2000, New Orleans, 7 April 2000.

IT21 *Projection pursuit regression as a tool for sensitivity analysis.* Invited talk, EPSRC International Workshop on Statistical Analysis of Computer Code Output, Gregynog, 10–14 April 2000.

IT22 *Bayesian nonparametric methods for risk assessment in nuclear waste disposal.* Invited talk, International Society for Bayesian Analysis (ISBA), Sixth World Meeting, Crete, 28 May 28–1 June 2000.

IT23 *Bayesian hierarchical modeling.* Plenary talk, International Society for Bayesian Analysis (ISBA), Sixth World Meeting, Crete, 28 May 28–1 June 2000.

IT24 *Computational and performance issues in the MCMC fitting of multilevel models.* Special invited talk, COMPSTAT 2000, Utrecht, Holland, 24 August 2000.

IT25 *Statistical analysis of performance indicators for UK higher education.* Invited talk, Social Statistics Section, Royal Statistical Society, London, England, 17 October 2000.

IT26 *Nonparametric model choice.* Plenary talk, 7th School of Linear Models, São Carlos, Brazil, 13 February 2001.

IT27 *A comparison of Bayesian and likelihood methods for fitting hierarchical models.* Plenary talk, 7th School of Linear Models, São Carlos, Brazil, 14 February 2001.

IT28 *Functional data analysis of complex computer simulation output: a case study in nuclear waste disposal risk assessment.* Invited talk, Interface 2001, Costa Mesa, CA, 14 June 2001.

IT29 *Nonparametric prior specification.* Plenary talk, European Meeting of Statisticians, Funchal, Madeira, 17 August 2001.

IT30 *Stochastic optimization for cost-effective quality assessment in health.* Invited talk, International Conference on Health Policy Research, Boston, MA, 9 Dec 2001.

IT31 *Nonparametric prior specification.* Invited talk, 7th Valencia International Meeting on Bayesian Statistics, Canary Islands, 3 June 2002.

IT32 *Statistical foundations of medical provider profiling.* Invited talk, Joint Statistical Meetings, 12 Aug 2002, New York.

IT33 *Statistical methodology for inverse problems.* Invited talk, SAMSI Workshop on Inverse Problem Methodology In Complex Stochastic Models, 23 Sep 2002, Durham NC.

IT34 *Strategies for MCMC Acceleration, part I.* Invited talk, SAMSI Workshop on Challenges in Stochastic Computation, 28 Sep 2002, Durham NC.

IT35 *Statistical analysis of performance indicators in UK higher education.* Invited talk, Royal Statistical Society Meeting on Performance Monitoring and Surveillance, 14 Jan 2003, London.

IT36 *Strategies for MCMC Acceleration, part II.* Invited talk, Joint Statistical Meetings, 6 Aug 2003, San Francisco.

IT37 *Strategies for MCMC Acceleration, part III.* Plenary talk, International Workshop on Markov Chain Monte Carlo: Innovations and Applications in Statistics, Physics, and Bioinformatics, 16 Mar 2004, Singapore.

IT38 *Bayesian hierarchical modeling.* Plenary presentation, ISBA (International Society for Bayesian Analysis) 2004 World Meeting, 23 May 2004, Viña del Mar, Chile.

IT39 *Bayesian model specification.* Invited talk, ISBA (International Society for Bayesian Analysis) 2004 World Meeting, 24 May 2004, Viña del Mar, Chile.

IT40 *Statistical methods for performance benchmarking in medicine.* Plenary talk, Analytic Strategies for Nursing Databases: A Collaborative Conference from the National Nursing Quality Database Consortium, 5–6 Nov 2004, Palo Alto CA.

IT41 *Bayesian model specification.* Plenary talk, International Conference/Workshop on Bayesian Statistics and Its Applications, Banaras Hindu University, Varanasi, India, 7 Jan 2005.

IT42 *Bayesian model specification.* Plenary talk, International Seminar on Bayesian Inference in Econometrics and Statistics, 1–2 Aug 2005, St. Louis MO.

IT43 *Bayesian model specification.* Plenary talk, 25th International Workshop on Bayesian Inference and Maximum Entropy Methods in Science and Engineering, 8 Aug 2005, San José CA.

Consultative or Other Services to Private Organizations

I have served as a statistical consultant to the following private organizations (among others): Southern Pacific Railroad (1979–80); AT&T Bell Laboratories, Murray Hill NJ (1987); and AEA Technologies plc (UK) 1997–98.

Editorial or Board Service to Publications

- Associate Editor (Theory and Methods), *Journal of the American Statistical Association*, 1988–1991.
- Associate Editor (Applications and Case Studies), *Journal of the American Statistical Association*, 1988–1994.
- Member, Editorial Board, *ASA-SIAM Series on Statistics and Applied Probability*, 1993–1995.
- Member, *Royal Statistical Society Research Section Committee* (responsible for editorial decisions on Read Papers), 1995–1998.
- Associate Editor, *Journal of the Royal Statistical Society, Series B*, 1995–1997.
- Associate Editor, *Health Services and Outcomes Research Methodology*, February 1996–present.

Service to Local, State, or Federal Governments

- From 1985 to 1988 I gave a series of 6 short courses (ranging in length from 1 to 5 days) on statistical methods to research staff at the US Health Care Financing Agency (HCFA), the part of the US government that administers the Medicare health program for elderly and handicapped Americans.

- From 1998 to the present I have served as a statistical advisor to the UK Higher Education Funding Council for England (HEFCE). In this capacity I have provided guidance on the creation and appropriate calibration of *performance indicators for higher education*, which are measures of process and outcome for UK universities (such as student dropout rates) which help the UK government judge the extent to which these universities carry out their public educational mandate successfully.

Outside Creative Activity

- Member, *Panel on Statistical Issues and Opportunities for Research in the Combination of Information*, convened by the Committee on Applied and Theoretical Statistics, U.S. National Research Council, 1990–1992.

- From Oct 1993 to the present I gave 66 invited talks to statistics departments, Royal Statistical Society gatherings, and other leading statistical organizations in the UK, US, Austria, Germany, Spain, and Israel (Bristol (3), Manchester (2), Seattle (2), Newcastle, Vienna, Kent, Graz, Dundee, Glasgow, Aberdeen, Edinburgh (2), Leeds (2), Southampton, Berlin, Warwick, Oxford (4), Birmingham, Avon, Cambridge (2), Madrid, Geneva, Leicester, Exeter, UCLA, the RSS Medical Section, Imperial College (2), Jerusalem (2), Haifa, Tel Aviv, University College London, AEA Technologies plc, the RSS Environmental Statistics Study Group, Durham, Stanford (2), Santa Cruz, Nottingham, Bath (2), Open, UCAS/HESA, Lancaster, the RSS Social Statistics Section, Berkeley, Sandia National Laboratories, CTB/McGraw-Hill, Seattle, Davis, the Naval Postgraduate School, USC, NASA Ames, the Wharton School at the University of Pennsylvania, the RAND Corporation, the University of Helsinki; the University of California, Santa Barbara; and the National Technical University of Athens), wrote 63 referee reports for leading international journals and book publishers based mainly in the US and UK, refereed 12 EPSRC and NSF grant applications, served on 1 NSF site visit panel, and helped to adjudicate the tenure and promotion cases for 11 academic statisticians in the US and Canada.

- International conferences organized:

  IC1 Co-organizer of *International Workshop on Model Uncertainty and Model Robustness*, Bath (UK), June-July 1995 (see **Grant Support** above).

  IC2 Organizer of half-day Royal Statistical Society Research Section meeting on *Design and Analysis of Complex Sample Surveys*, London, May 1997.

  IC3 Co-organizer of *International Workshop on Stochastic Model-Building and Variable Selection*, Duke University, October 1997.

  IC4 Co-organizer of *Bayesian Nonparametrics International Workshop*, University of Michigan, July 2001.

  IC5 Co-organizer of *International Workshop on Bayesian Data Analysis*, University of California, Santa Cruz, Aug 2003 (see **Grant Support** above).

  IC6 Member, Advisory Committee, *International Conference on Bayesian Methods and Applications*, Banaras Hindu University, Varanasi, India, Jan 2005.

STUDENTS AND RESEARCH ASSOCIATES

Graduate Students

NB In the UK academic system, graduate students work one-on-one with their supervisors (M.Sc. students for 1–2 years, Ph.D. students for 3 years). Below I list the graduate students whose dissertations I have supervised in a one-on-one fashion in the US and UK since 1991.

- *Health and social support in the elderly.* K Raube, RAND Graduate School of Policy Studies (Ph.D., 1991). (She is now Adjunct Professor and Executive Director of the Graduate Program in Health Management at the Haas School of Business in the University of California, Berkeley.)

- *Topics in hierarchical modeling.* W Browne, Department of Mathematical Sciences, University of Bath (M.Sc., 1995, with distinction); recipient, James Duthie Prize for best M.Sc. Dissertation, University of Bath, 1995. (He is now a Lecturer (equivalent to an Assistant Professor in the US) in the Division of Statistics within the School of Mathematical Sciences at the University of Nottingham (UK).)

- *Variable selection via hierarchical modeling and utility*, D Fouskakis, Department of Mathematical Sciences, University of Bath (M.Sc., 1996, thesis with distinction). (He is now a Lecturer in the Department of Mathematics at the National Technical University of Athens (Greece).)

- *Fixing the broken bootstrap.* C McKail, Department of Mathematical Sciences, University of Bath (M.Sc., 1997). (He now works at a leading software company in the London area.)

- *Markov chain Monte Carlo methods for inference on family trees.* R Cheal, Department of Mathematical Sciences, University of Bath (Ph.D., 1997). Internal and external examiners: C Jennison and W Gilks (respectively). (He is now a postdoc in the Statistics Group within the Department of Mathematical Sciences at the University of Bath (UK).)

- *Cardiac mortality and dietary risk factors: Survival analysis with time-varying covariates.* D Kounali, Department of Mathematical Sciences, University of Bath (M.Sc., 1998). (She is currently finishing a Ph.D. in statistics at the University of Southampton (UK).)

- *Applying MCMC methods to multi-level models.* W Browne, Department of Mathematical Sciences, University of Bath (Ph.D., 1999). Dr. Browne's dissertation was nominated for the 1999 Savage Award for best Bayesian Ph.D. dissertation in the world. Internal and external examiners: A Robinson and D Spiegelhalter (respectively).

- *Stochastic optimization for cost-effective quality assessment in health.* D Fouskakis, Department of Mathematical Sciences, University of Bath (Ph.D., 2000). Dr. Fouskakis was short-listed for the 1999 Ede and Ravenscroft Research Prize at the University of Bath, and his dissertation was nominated for the 2001 Savage Award and the 2003 Lefkopouleion Award for the best statistics Ph.D. dissertation in Greece. Internal and external examiners: M Hurn and S Richardson (respectively).

- *Statistical analysis of performance indicators in UK higher education.* M Gittoes, Department of Mathematical Sciences, University of Bath (Ph.D., 2001). Internal and external examiners: A Robinson and H Goldstein (respectively). (He is now a Member of the Technical Staff at the Higher Education Funding Council for England (HEFCE) in Bristol (UK).)

- *Functional data analysis: modeling of groundwater contamination.* B Mendes, Department of Mathematical Sciences, University of Bath (M.Phil., 2002). (He is now pursuing postdoctoral studies with me at UCSC.)

- *Uncertainties in modeling groundwater contamination.* B Mendes, Department of Physics, University of Stockholm (Ph.D., 2003; co-advisor with A Pereira).

- *Mirror-jump sampling: a strategy for MCMC acceleration.* S Liu, Department of Computer Science, University of California, Santa Cruz (M.S., 2003). (She is now working toward a Ph.D. in the Department of Biostatistics at the University of Michigan.)

- *Contributions to Bayesian statistical analysis: model specification and nonparametric inference.* M Krnjajić, Department of Applied Mathematics and Statistics, University of California, Santa Cruz (Ph.D., September 2005; co-advisor with Thanasis Kottas). (He now has a post-doctoral position at the Lawrence Livermore National Laboratories.)

- *Bayesian nonparametric modeling for well-calibrated location and scale inferences with skewed and long-tailed data.* J Wallerius, Department of Applied Mathematics and Statistics, University of California, Santa Cruz (M.S. anticipated, 2006).

- *Bayesian estimation of cytonuclear disequilibria under models of immigration and epistatic mating.* R Young, Department of Ecology and Evolutionary Biology, University of California, Santa Cruz (Ph.D. anticipated, 2006; co-advisor with R Vrijenhoek).

- *Mathematical and statistical models of cooperation and conflict in environmental resource use.* P Towbin, Department of Applied Mathematics and Statistics, University of California, Santa Cruz (Ph.D. anticipated, 2008).

Postdoctoral Research Associates

- *Model uncertainty and sensitivity analysis in risk assessment studies of groundwater contamination from nuclear power plants (GESAMAC).* Dr R Cheal, University of Bath (UK), Jan 1996–Dec 1998.

- *Measuring quality of uncertainty assessments in complex sample surveys.* Dr R Bowater, University of Bath (UK), Jan–Dec 1998.

- *Functional data analysis and risk assessment in environmental studies.* Dr B Mendes, University of California, Santa Cruz, Jan 2003–present.

Laboratory Assistants

(none)

Collaborators

- In 1995 I arranged a sabbatical visit to the Statistics Group at the University of Bath (UK) by J Faraway from the University of Michigan, who visited the Group from July to December 1995, principally to have research discussions with C Chatfield and me.

TEACHING

Classroom Teaching

From 1980 to the present I have taught more than 3,140 undergraduate and 580 graduate students (more than 3,730 students overall) in 55 classes and 14 individual graduate student supervisions at 8 universities (the University of California, Berkeley; the University of Chicago; the RAND Graduate School of Policy Studies; the University of Washington; the University of California, Los Angeles; the University of Bath; the University of Neuchâtel; and the University of California, Santa Cruz) in Switzerland, the U.K. and the U.S.

NB (1) From 1980 to 1981 I taught two courses while still serving as a graduate student at the University of California, Berkeley. (2) In the tables below L and U denote lower and upper division undergraduate classes and G signifies graduate classes, and F, W, and S stand for fall, winter, and spring quarters, respectively. (3) With student satisfaction scores normalized on a scale from 0 to 100, I have never received a mean score below 80 in any of the classes listed below.

1979–80 (University of California, Berkeley)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
S	Statistics 20 (L)	Statistics	37	95	no

1980–81 (University of California, Berkeley)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
S	Statistics 20 (L)	Statistics	44	89	no

1981–82 (University of Chicago)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
F	Statistics 220 (L)	Statistical Methods and Applications	126	87	no
W	Statistics 408 (G)	Data Analysis	55	84	no
S	Statistics 220 (L)	Statistical Methods and Applications	109	92	no

1982–83 (University of Chicago)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
F	Statistics 220 (L)	Statistical Methods and Applications	132	93	no
W	Statistics 410 (G)	Robust Statistical Methods	11	82	no
S	Statistics 220 (L)	Statistical Methods and Applications	141	89	no

1983–84 (University of Chicago)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
F	Statistics 220 (L)	Statistical Methods and Applications	138	78	no
W	Statistics 320 (U)	Multivariate Statistical Methods	47	87	no
S	Statistics 220 (L)	Statistical Methods and Applications	150	90	no

1984–85

(none)

1985–86 (RAND Graduate School of Policy Studies and Washington)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
F (RAND)	SDA 1 (G)	Statistics and Data Analysis I	12	100	no
S (Washington)	Statistics 390 (U)	Statistics for Engineering	177	90	no

1986–87 (RAND Graduate School of Policy Studies)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
F	SDA 1 (G)	Statistics and Data Analysis I	14	86	no

1987–88 (RAND Graduate School of Policy Studies)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
F	SDA 1 (G)	Statistics and Data Analysis I	17	76	no

1988–89 (RAND Graduate School of Policy Studies)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
W	SDA 2 (G)	Statistics and Data Analysis II	15	80	no

1989–90 (RAND Graduate School of Policy Studies)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
W	SDA 2 (G)	Statistics and Data Analysis II	19	84	no

1990–91 (RAND Graduate School of Policy Studies and UCLA)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
W (RAND)	Mult (G)	Multivariate Statistical Methods	21	90	no
S (UCLA)	Mathematics 340 (G)	Design and Analysis of Experiments and Sample Surveys	36	78	no

1991–92 (RAND Graduate School of Policy Studies and UCLA)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
F (UCLA)	Mathematics 20H (L)	Statistics (honors)	41	88	no
W (RAND)	Mult (G)	Multivariate Statistical Methods	21	90	no
S (UCLA)	Mathematics 20 (L)	Statistics	213	84	no

1992–93 (UCLA)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
F (2 sections)	Mathematics 20 (L)	Statistics	535	86	no
S	Mathematics 340 (G)	Design and Analysis of Experiments and Sample Surveys	40	93	no

1993–94 (Bath)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
F	Mathematics 179 (G)	Computationally Intensive Statistical Methods	13	100	no
W	Mathematics 84 (U)	Linear Statistical Modeling	48	88	no
S	Mathematics 90 (U)	Multivariate Statistical Methods	39	92	no

1994–95 (Bath)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
F	Mathematics 179 (G)	Computationally Intensive Statistical Methods	14	93	no
W	Mathematics 84 (U)	Linear Statistical Modeling	50	86	no
S	Mathematics 90 (U)	Multivariate Statistical Methods	44	82	no

1995–96 (Bath and Neuchâtel)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
F (Bath)	Mathematics 179 (G)	Computationally Intensive Statistical Methods	17	94	no
W (Bath)	Mathematics 87 (U)	Design and Analysis of Experiments and Sample Surveys	47	79	no
S (Bath)	Mathematics 85 (U)	Statistical Model-building	53	91	no
S (Neuchâtel)	Bayes (G)	Bayesian Statistics	35	94	no

1996–97 (Bath and Neuchâtel)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
F (Bath)	Mathematics 179 (G)	Computationally Intensive Statistical Methods	16	88	no
W (Bath)	Mathematics 85 (U)	Statistical Model-building	58	86	no
S (Neuchâtel)	Bayes (G)	Bayesian Statistics	40	93	no

1997–98 (Bath and Neuchâtel)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
W (Bath)	Mathematics 85 (U)	Statistical Model-building	51	79	no
S (Bath)	Mathematics 92 (U)	Statistical Inference	43	95	no
S (Neuchâtel)	Bayes (G)	Bayesian Statistics	46	91	no

1998–99 (Bath)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
W	Mathematics 85 (U)	Statistical Model-building	47	82	no
S	Mathematics 92 (U)	Statistical Inference	49	89	no

1999–2000 (Bath)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
W	Mathematics 85 (U)	Statistical Model-building	57	88	no
S	Mathematics 92 (U)	Statistical Inference	51	91	no

2000–01 (UCSC)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
S	Engineering 181 (U)	Bayesian Statistics	11	100	no

2001–02 (UCSC)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
F	Engineering 5 (L)	Statistics	99	71	no
F	Computer Science 297B (G)	Individual Study	1	—	no
W	Engineering 206 (G)	Bayesian Statistics	30	93	no

2002–03 (UCSC)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
F	Engineering 5 (L)	Statistics	124	82	no
F	Computer Science 299A (G)	Thesis Research	1	—	no
W	Engineering 206 (G)	Bayesian Statistics	39	100	no
W	Computer Science 299B (G)	Thesis Research	1	—	no
W	Computer Science 296 (G)	Masters project	1	—	no
S	Computer Science 299A (G)	Thesis Research	1	—	no

2003–04 (UCSC)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
F	Computer Science 299A (G)	Thesis Research	1	—	no
W	Engineering 206 (G)	Bayesian Statistics	36	75	no
W	Computer Science 299A (G)	Thesis Research	1	—	no
S	Engineering 5 (L)	Statistics	168	79	no
S	Engineering 88A (L)	Thinking About Uncertainty (discovery seminar)	7	86	no
S	Engineering 299A (G)	Thesis Research	1	—	no

2004–05 (UCSC)

Quarter	Course	Course Title	Enrolled	% Evaluations Returned	Shared?
F	AMS 297A (G)	Thesis Research	1	—	no
F	Computer Science 299A (G)	Thesis Research	1	—	no
W	AMS 206 (G)	Bayesian Statistics	28	75	no
W	AMS 297A (G)	Thesis Research	1	—	no
W	AMS 299B (G)	Thesis Research	1	—	no
S	AMS 5 (L)	Statistics	209	71	no
S	AMS 88B (L)	Thinking About Uncertainty (discovery seminar)	2	50	no
S	AMS 297B (G)	Thesis Research	1	—	no
S	AMS 299B (G)	Thesis Research	1	—	no

My teaching evaluations are strong at both the undergraduate and graduate levels. Table 1 summarizes the results of the end-of-quarter instructor evaluation surveys for all of the classes I've taught at UCSC. In these surveys students are asked a number of questions about each course and give their replies on 5–point ordered categorical scales. The standard measures of quality at UCSC are the percentages of responses in the top two categories on the three most important summary questions (noted in the table). The table gives summaries separately for lower-division undergraduate (L), upper-division undergraduate (U), and graduate (G) courses, and overall.

On average, I get a 78% response rate for the surveys in my classes; 92% of the students rate my overall teacher effectiveness as very good (VG) or excellent (E); 82% give a VG or E to my courses overall as learning experiences; and 84% give one of the top two responses when asked whether they gained a good understanding of the course content. The results are a bit lower at the lower-division level, but still quite high; please bear in mind that the course I've given most frequently at that level (ENGR/AMS 5; introductory statistics) is not easy to teach (mainly because almost all of the students are in the classroom not because they want to be there but because they have to be there). Note also that my ENGR/AMS 5 enrollments have been steadily increasing, from 99 to 124 to 168 to 209 (a 111% gain in four years). The graduate course I've been teaching, ENGR/AMS 206, is one of the core offerings for all AMS graduate students (it's also a required course for all bioinformatics graduate students from the Department of Biomolecular Engineering) and has the highest enrollment of all our graduate

Table 1: *Summary of results of instructor evaluation surveys in all the classes I've taught at UCSC.*

ENGR/ AMS Course	Q	n_P/n_E (%)	Instructor's Overall Effectiveness As a Teacher			Course Overall as a Learning Experience			I Gained a Good Understanding of the Course Content		
			VG	E	Total	VG	E	Total	SoA	StA	Total
181 (U)	S01	11/11 (100%)	9%	91%	100%	18%	73%	91%	55%	36%	91%
5 (L)	F01	70/99 (71%)	41%	42%	83%	42%	30%	72%	46%	37%	83%
206 (G)	W02	28/30 (93%)	11%	85%	96%	7%	89%	96%	52%	48%	100%
5 (L)	F02	102/124 (82%)	18%	79%	97%	41%	48%	89%	36%	54%	90%
206 (G)	W03	39/39 (100%)	18%	82%	100%	28%	64%	92%	34%	54%	88%
206 (G)	W04	27/36 (75%)	15%	85%	100%	33%	63%	96%	35%	62%	97%
88A (L)	W04	6/7 (86%)	33%	50%	83%	33%	33%	67%	50%	33%	83%
5 (L)	W04	132/168 (79%)	44%	50%	94%	47%	31%	88%	44%	41%	85%
206 (G)	W05	21/28 (75%)	6%	94%	100%	21%	79%	100%	42%	47%	89%
88B (L)	S05	1/2 (50%)	0%	100%	100%	100%	0%	100%	100%	0%	100%
5 (L)	S05	148/209 (71%)	36%	51%	87%	48%	28%	76%	43%	31%	74%
Mean (L) [Total]		[459/609 (75%)]	35%	56%	91%	45%	34%	79%	42%	40%	82%
Mean (U) [Total]		[11/11 (100%)]	9%	91%	100%	18%	73%	91%	55%	36%	91%
Mean (G) [Total]		[115/133 (86%)]	13%	86%	99%	23%	73%	96%	40%	53%	93%
Mean [Total]		[585/753 (78%)]	30%	62%	92%	40%	42%	82%	42%	42%	84%

Notes: (1) n_E and n_P are the numbers of students enrolled in the class and participating in the instructor evaluation survey, respectively; Q is quarter. (2) VG, E, SoA, and StA stand for Very Good, Excellent, Somewhat Agree, and Strongly Agree, respectively.

courses (averaging 30 students each time it's offered).

Other Teaching and Graduate Supervision

- M.Sc. supervisor (2001–03): S Liu (statistics).
- Ph.D. co-supervisor (with Thanasis Kottas) (2001–2005): M Krnjajić (statistics).
- Ph.D. co-supervisor (with R Vrijenhoek) (2003–present): R Young (biology).
- M.Sc. supervisor (2005–present): J Wallerius (statistics).
- Member, Ph.D. thesis committee (2001–03): R Karchin (bioinformatics).
- Ph.D. qualifying exam committee (2004): V Kumar (physics).
- Ph.D. qualifying exam committee (2004): X Shi (computer science).
- Ph.D. qualifying exam committee (2004): J Masters (computer science).
- Ph.D. qualifying exam committee (2004): R Gramacy (statistics).
- Ph.D. supervisor (2004–present): P Towbin (statistics).
- Ph.D. qualifying exam committee (2005): Weining Zhou (statistics).

Employers review employment history to determine whether the jobs the applicant has held and their experience are a good match for the company's requirements. They also look at how long the person has held each job. Many jobs of short duration may imply the candidate is a job hopper and won't stay long if hired. Prospective employers also use your work history to verify the information you have provided. Many employers conduct employment background checks to confirm the information is accurate.