University of Washington Department of Statistics

Michael D. Perlman, Fritz W. Scholz and Galen R. Shorack

Pre-history (1939–1971)

The modern era of Statistics at the University of Washington (UW) began in 1939 with the arrival of Z. W. (Bill) Birnbaum in the Department of Mathematics. There was but a single course in descriptive statistics. Bill began the process that led to the development of one of the first comprehensive undergraduate statistics programs in the United States.

Born in Lwów, Austria–Hungary, in 1903, Birnbaum studied mathematics there under Steinhaus (his major professor for his 1929 PhD) and Banach and then continued his studies at Göttingen—still central to world mathematics—and enjoyed contact with many of its luminaries. After working as an actuary, Bill emigrated to the U.S. and accepted a research assistantship at New York University. Contact there with Seattle native Harold Hotelling of Columbia led to his appointment at UW Mathematics—with recommendation letters from Courant, Landau, and Albert Einstein. By 1948 he had founded the Laboratory of Mathematical Statistics to serve as a "focus of statistical activity within the university." In particular, the physical component of this lab would soon hold a room full of the then-state-of-the-art Friden calculators. Bill also instituted the Laboratory of Statistical Research in 1948, through its long association with the Office of Naval Research, funding for the graduate students and faculty components of the statistics program at Washington was strengthened and expanded. He also served as a consultant at Boeing, and subsequently at the Boeing Scientific Research Laboratories (BSRL) from its inception in 1962 until its demise in 1971. That

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association would include joint seminars and research papers involving Birnbaum and UW Mathematics probabilist Ron Pyke (Birnbaum PhD 1956) as well as UW Mathematics (statistics) graduates Sam Saunders (Birnbaum PhD 1956) and Al Marshall (Birnbaum PhD 1958) at BSRL. Bill's work included distribution-free statistics, reliability, and competing risks. He served as editor of the *Annals of Mathematical Statistics* during 1967–1970.

Douglas Chapman joined UW Mathematics in 1949. A Canadian fresh from a PhD at Berkeley (under Neyman), he was a key figure in the development of the program in statistics within Mathematics until his relocation to the UW College of Fisheries in 1968, where he served as dean from 1971 to 1980. Chapman's prime interests centered on wildlife statistics (especially estimating marine mammal populations) and population dynamics, with other papers on more traditional topics such as estimation within gamma models and distribution-free statistics. He chaired the International Whaling Commission's Scientific Committee from 1965 until 1974 during a period when new methods were developed to assign whale quotas. He warned early on that the numbers being taken by whalers in the 1960s were not sustainable. He also chaired the U.S. Marine Mammal Commission's Scientific Committee from 1973 to 1976 and the entire commission from 1976 to the early 1980s.

Significantly, Chapman and Ed Perrin organized the Biomathematics Group in 1963 (Doug served as its first chair, 1964–1969). It was this unit that would solidify the close cooperation between statisticians on the upper (arts and sciences) and lower (medical, fisheries/forestry) campuses. Early on, a majority of the students in graduate courses in statistics (within Mathematics) came from lower campus.

Ronald Pyke (another Canadian), after spending 2 years each at Stanford and Columbia, joined the UW mathematics faculty in 1960—thus creating a significant nucleus of high visibility. Pyke was a probabilist with broad interests at the interface of probability and statistics and provided a real sense of energy within the Statistics Group. Indeed, much of the day-to-day contact and organization of group efforts within the Statistics Group was directed and energized by Ron. His interests included distribution-free statistics, Markov renewal processes, spacings, empirical processes, and Brownian sheets. He served as the first editor of the Annals of Probability, 1972–1975.

The 1960s brought several significant additions (Table 1) to the Statistics Group in Mathematics. Don Ylvisaker (Stanford PhD under E. Parzen; time series, reproducing kernel Hilbert spaces) arrived in 1961. Galen Shorack (Stanford PhD under L. Moses) arrived in 1965. Pyke sat in on his first nonparametrics class, leading to their well-known joint 1968 and 1969 papers on applications of empirical processes to asymptotic properties of rank statistics. Other Shorack interests were linear combinations of functions of order statistics, robustness, and reliability; he began his 17-year work on empirical processes that later became the now classic monograph "Empirical Processes with Applications to Statistics" (1986) with Jon Wellner, a graduate of the UW Biomathematics program in 1975.

Table 1 Statistics Group and probabilists in Mathematics 1939–1971

Statistics Group	Probabilists
Z. W. Birnbaum (1939–1974)	Robert Blumenthal (1956–1997)
Douglas G. Chapman (1949–1968)	Ron Getoor (1956–1966)
Robert Tate (1953–1965)	David Newman (1961–1965)
Ronald Pyke (1960–1998)	John Woll (1961–1966)
Donald Ylvisaker (1961–1968)	Ramesh Gangolli (1962–1997)
Galen R. Shorack (1965–)	Robert Smythe (1969–1976)
John van Ness (1966–1970)	Y.K. Chan (1969–1977)
Lloyd Fisher (1966–1972)	

In 1966, both John van Ness (Brown PhD under M. Rosenblatt; time series) and Lloyd Fisher (Dartmouth PhD under J. Lamperti; probability theory) joined the Mathematics faculty. Both moved toward statistics, especially Fisher who sought to teach all available statistics courses.

Further developing the undergraduate program, this group also established both Master of Science (thesis) and Master of Arts (nonthesis) degrees in Statistics within UW Mathematics. Other Math and Biostatistics faculty that contributed to statistics and probability teaching included Norm Breslow, Chuck Bell, Al Hallstrom, Ramesh Gangolli, Doug Lind, Dan Wulbert, Steve Monk, John Westwater, Barney Glickfeld, Jim Jans, Robert Nunke, Kitty Baxter, and visitors Stan Sawyer and Aziz Laghrari.

Chapman was the first to see the need for a separate department of statistics. In 1967, he polled the Statistics Group to see if anyone else was ready. In the wake of a lukewarm response, he prepared for his exit in 1968, which would lead to the formation of the Center for Quantitative Science (CQS) in Forestry, Fisheries, and Wildlife. He established his new home in the College of Fisheries—a natural choice, based on his long relationship and collaboration with members of that college. He would serve as Dean of Fisheries 1971–1980 and as Director of CQS 1980–1982.

After Chapman's departure from Mathematics, the other members of the Statistics Group soon realized that it was indeed time to form a separate department for statistics. This endeavor was led by Ron Pyke. By November 1969, an Ad Hoc Committee on Statistics appointed by Phillip Cartwright, Dean of the College of Arts and Sciences (A&S), recommended that a Department of Statistics be established. The committee stated that the purpose of the new department would be "to provide a more readily identifiable focus of mathematical statistics and probability on campus." It would be charged to work closely with Mathematics, CQS, and Biostatistics.

On November 5, 1970, A&S Acting Dean William Phillips announced that the outgoing Dean Cartwright endorsed the Ad Hoc Committee's recommendations to form a Department of Statistics by July 1, 1971. Phillips's letter noted that Mathematics, CQS, and Biostatistics held the largest concentrations of statisticians but that Economics, Oceanography, Psychology, Sociology, Business Administration,

Engineering, and Fisheries and Forestry all contained interested faculty. Lloyd Fisher spent much of 1970–1971 working for the proposed department: writing up course descriptions, researching enrollments, writing proposals.

In the end, although the formation of the new department appeared to have gained approval at the highest university levels, it became a casualty of the economic downturn known locally as the Boeing Bust, which saw Boeing employment levels plummet from 108,900 to 38,690 by April 1971. This downturn not only doomed the formation of the department at that time but also spelled an end to the rich history of the Boeing Scientific Research Laboratories. The final rejection was delivered by outgoing Acting Dean Cartwright, though it was rumored that this was a courtesy to spare the incoming A&S Dean George Beckman (Dean 1971–1978, UW Provost 1978–1988).

Formation of the Department (1971–1979)

As consolation to the Statistics Group, the next available position in Mathematics had been committed to a statistician. In 1972, after some struggle within Mathematics to retain this commitment, Fritz Scholz (Berkeley PhD under Erich Lehmann, 1971) was appointed Assistant Professor. However, his position only replaced Lloyd Fisher's, who transferred to Biostatistics at the same time.

The status quo was maintained through much of the 1970s, but Mathematics shrank from 70 faculty in 1965 to 57 in 1978 and understandably sought to maintain its most prized areas of strength. Birnbaum retired in 1974, while Fisher, van Ness, Smythe, and Chan had left Mathematics between 1970 and 1977.[1] Computer Science had split from Mathematics in 1967 and was growing rapidly. Moreover, demand by Mathematics majors was shrinking, while demand for nontechnical mathematics courses for the social sciences was growing.

Much of the impetus for the final creation of a statistics department came from the Biostatistics Department, located in the School of Public Health and Community Medicine (SPHCM). Biostatistics, although a thriving and vigorous department with a strong graduate program, was funded primarily by federal grant support and had relatively few state-funded positions to support its graduate teaching. For this it relied heavily on the statisticians and probabilists within Mathematics, but their numbers had dwindled during the 1970s. In 1977, Biostatistics Chair Donovan Thompson invited Pyke, Shorack, and Scholz to discuss transferring all three of their positions from Mathematics to Biostatistics.

Meanwhile, the applied mathematicians within Mathematics were also feeling the stresses of the times. In 1977, they proposed a Division of Statistics and Applied Mathematics (DSAM). Al Goldstein, Herbert Brownell, Terry Rockafeller, Ron Pyke, and Victor Klee came to support the DSAM, though Pyke was

[1] Mathematics added probabilists Bruce Erickson in 1973 and Richard Bass in 1977.

simultaneously exploring other options for statistics. Shorack (on sabbatical at ANU in Canberra) wrote—recalling the "lost year" that Fisher had spent in the failed 1968–1971 attempt for a Department of Statistics—that he would again work hard for a Department of Statistics or would support the DSAM proposal, but only if the UW administration would first commit irrevocably to the formation of such a unit.

On October 26, 1978, the Ad Hoc Committee on Applied Mathematics chaired by Bill Richardson, Dean of SPHCM (which housed the Biostatistics Department), issued its report to the Provost, George Beckmann, who would prove very supportive of the creation and nurture of the new Department of Statistics. The Ad Hoc Committee strongly endorsed the formation of a Department of Statistics in the College of A&S.

The Provost accepted the Ad Hoc Committee's recommendation and on January 24, 1979, Acting Dean Frank Miyamoto of A&S appointed a Planning Committee for Statistics chaired by Paul Hodge, Associate Dean for Sciences. Its mandate was "to prepare a plan whereby the College of A&S could best create a Department of Statistics that would benefit the students of the University, the statistics faculty in the various colleges, and the general reputation of the University in the field of statistics, building on the already outstanding programs in Biostatistics and Mathematics." It was also charged with responding to "the increasingly disjointed nature of statistics at the University and the resulting inefficiency of efforts in both teaching and research" as well as "to the strong desire [of] the statistics faculty within the Department of Mathematics to have its discipline recognized, given visibility and autonomy, and tied in more closely to statistics programs elsewhere on campus."

The Planning Committee reported as follows: "The Department of Statistics will satisfy … the considerable need for a focal point for the discipline of statistics, serving to coordinate and unify where possible the extensive teaching, research, and consulting activities in statistics on campus …. [It] should have 4 and 6 positions in 1979–1980 and 1980–1981, respectively, together with several joint positions with other departments. During 1981–1986, additional regular and joint positions should be added, including two joint appointments with the social sciences…. [Its] course offerings should include unified service courses as well as applied and theoretical core courses …. A Statistical Consulting Center should be established to coordinate consulting activities within the University …."

These recommendations were accepted by Provost Beckmann, and the Department of Statistics was established by the Board of Regents on July 13, 1979. The department's development over its first decade was well supported by Dean Ernest Henley and Associate Dean David Prins of the College of A&S and by Provost George Beckmann.

Statistics Faculty 1979–1989

The initial faculty members in 1979–1980 were Pyke[2] (Professor), Shorack (Professor), Michael Perlman (Chicago; chairman), and Piet Groeneboom (Visiting Assistant Professor). Z. W. Birnbaum, although already retired, was retroactively made Emeritus Professor of Statistics, Fritz Scholz (Boeing) was given an affiliate appointment, and Hubert (Tad) Blalock and Chapman were given 0% faculty appointments.

During 1980–1982, Doug Martin (100%), Cliff Lunneborg[3] (25%), and Ben King[4] (50%) transferred all or part of their appointments to Statistics from Electrical Engineering, Psychology, and the Business School, respectively. Joe Felsenstein (UW Genetics), Charles Nelson (UW Economics), and David Mason (Delaware) were given adjunct/affiliate appointments.

The first appointees initiated by the department arrived in 1980: Peter Guttorp (Assistant Professor) and June Morita (Lecturer), PhDs from Berkeley of David Brillinger and Kjell Doksum, respectively. In 1981, Paul Sampson (PhD Michigan; visiting assistant professor, Chicago) joined the department as Assistant Professor. Mary Lou Thompson (Princeton) was acting assistant professor in 1981–1983.

During 1981–1989 the following new appointments were made: Andreas Buja[5] (ETH Zurich), Judy Zeh (UW EE), Jon Wellner (UW, Rochester), Don Percival (UW Applied Physics Lab), Antonio Possolo[6] (Yale), Werner Stuetzle (ETH Zurich, Stanford), John McDonald (Stanford), Andrew Siegel (Princeton), Elizabeth Thompson (Cambridge UK), Adrian Raftery (Trinity College Dublin; joint w. Sociology), Finbarr O'Sullivan[7] (Wisconsin; joint w. Biostatistics), and Julian Besag[8] (Durham UK).

In its early years, the department made a concerted effort to gain national and international visibility by hosting summer and sabbatical visitors attracted by the appealing environment of Seattle and the Pacific Northwest. In a single year, 1981–1982, the department hosted 21 extended visitors, who contributed greatly to the academic discourse in the young department.

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[2] Ron subsequently returned to Mathematics; he passed away in 2005.

[3] Tragically, Cliff drowned in Lake Washington in 2005.

[4] However, Ben soon moved to the Educational Testing Service in Princeton.

[5] Andreas is now at the Wharton School, University of Pennsylvania.

[6] Antonio moved to Boeing's Applied Statistics Group in 1989; he is now Division Chief for the Statistical Engineering Division of NIST.

[7] Finbarr moved to the University of Cork, Ireland, in 1996.

[8] Julian passed away in 2010.

Academic Courses and Degrees 1979–1989

The new department inherited several courses from Mathematics: the one-quarter undergraduate service course 311 (joint with Econ 281 and 580[9]), the undergraduate sequence 341-2 for statistics majors, the MS graduate theory sequence renumbered 511-2-3, and the PhD graduate theory sequence 581-2-3. An immediate issue was the disposition of the undergraduate (394-5-6, 491-2) and graduate (521-2-3) probability courses located in the Mathematics Department and taught by Pyke, Shorack, and probabilists Bob Blumenthal, Bruce Erickson, and Richard Bass. Agreement was reached for a 50–50 division of these courses between Mathematics and Statistics, averaged over a 2-year cycle; this agreement has remained remarkably stable.

Despite its limited graduate course offerings, statistics was able to implement a graduate program relatively quickly by utilizing biostatistics graduate courses covering topics such as linear models, applied regression analysis, categorical data, and survival analysis. Meanwhile, embracing the computer revolution in statistics, including the bootstrap, interactive computing and graphics, S, and the Princeton robustness study, Statistics began to develop its own graduate courses in robustness (Martin), time series (Martin, Percival), stochastic modeling (Guttorp), sample surveys (Morita), multivariate analysis (Perlman, Sampson), statistical computing (Buja, Stuetzle, McDonald), empirical processes (Wellner), statistical genetics (Thompson), Bayesian statistics (Raftery), and spatial statistics (Besag, Guttorp). In a related vein, Martin's relationship with Bell Labs led to his founding the statistical software company Stat Sci in Seattle in 1988, its prime product being S-Plus. A number of future statistics department graduates would be employed there.

The department's graduate program was established officially in 1982 after the mandatory 3-year review period, although several UW graduate students had already transferred unofficially to statistics. Its first PhD dissertation "The statistics of long-memory processes" was completed in 1983 by Don Percival under the supervision of Doug Martin.

At the same time, the department established an undergraduate statistics major but soon also entered into a collaboration with Mathematics, Computer Science, and Applied Mathematics on the Applied and Computational Mathematical Sciences undergraduate degree. This program provides a well-rounded foundation in the mathematical sciences with additional concentration in one of the participating fields, including a statistics pathway.

Upon their arrival in 1980, Guttorp and Morita introduced a new service course, Stat 220, based on the then-new textbook developed by Freedman, Pisani, and Purves at Berkeley. In 1981, Doug Martin convinced the Civil and Electrical Engineering Departments to include the newly created calculus-based introductory

[9] Charles Nelson, chairman of Economics, subsequently transferred Econ 281 and 580 to Statistics.

course Stat 390 in their curricula. Cliff Lunneborg introduced upper division undergraduate courses in applied multivariate analysis and nonparametric statistics.

Relationships with Biostatistics and Boeing

Statistics and biostatistics have maintained an extremely close and effective collaboration. The two departments share major core requirements, notably the MS and PhD statistical theory and the PhD statistical methodology sequences and the associated qualifying exams; consulting training for graduate students; the Statistical Genetics PhD pathway; and frequent joint seminars and social events. Graduate students in one department often conduct their dissertation research under a supervising faculty member in the other department. All this ensures that the faculty and graduate students of the two departments interact and know each other well, both personally and professionally.

When Scholz left Mathematics for the Applied Statistics Group (ASG) at Boeing in 1978, he reestablished the important connection to Boeing that had existed earlier via Boeing Scientific Research Laboratories (BSRL) in the 1950s and 1960s.

Recent Years (1990–2011)

Space does not allow a comprehensive listing of faculty and student accomplishments, so this section presents only some of the highlights. A more thorough listing can be found at the following websites:

Faculty research, publications, awards: http://www.stat.washington.edu/research/books/
PhD graduates research, publications, awards:
Current faculty and students: http://www.stat.washington.edu/www/people/
PhD theses: http://www.stat.washington.edu/people/students/thesis/
Technical reports: http://www.stat.washington.edu/research/reports/
Honors and awards 2001–2010: http://www.stat.washington.edu/news/recent/

Interdisciplinary Programs

National Research Center for Statistics and the Environment. NRCSE (1996–2002) was established at UW under a $5 million collaborative agreement with the EPA, with Peter Guttorp as director and Paul Sampson as associate director.

NRCSE conducted research in problems related to air and water pollution. The center had 33 members from seven schools and colleges at the university, three postdocs, and 29 graduate students. Over the years 229 visitors spent time at the center. NRCSE provided a platform for multidisciplinary interaction with respect to a wide range of problems related to statistical analysis of environmental concerns. The research was published in 6 books and 145 scientific papers.

Statistical Genetics. The StatGen program at the UW, initiated in 1999–2000, is a joint endeavor of Statistics and Biostatistics. It consists of PhD tracks in the two departments and an Interdisciplinary Graduate Certificate program. The current core faculty number 18, from Statistics, Biostatistics, Genome Sciences, Medical Genetics, Epidemiology, and FHCRC, and the program works in close partnership with the program in Computational Molecular Biology. The core course sequence developed in 1999–2000 continues to evolve and attracts students from a variety of graduate programs. The program has been led by Elizabeth Thompson since 1999 but gained a broader foundation with the arrival of Professor Bruce Weir to chair the Department of Biostatistics in 2005. His long-running NSF-funded Summer Institute in Statistical Genetics is now firmly established at UW and brings worldwide students and faculty to Seattle each June. Led by Bruce Weir, the UW StatGen program also secured an NIH Training grant which provides core support for outstanding students in the subdiscipline.

Center for Statistics and the Social Sciences. In the late 1990s, the department spearheaded the establishment of CSSS in 1999, to foster collaborative research between statistics and the social sciences and to provide a rich menu of statistical and quantitative methods courses for social science graduate students. The university provided six faculty positions for CSSS, most to be jointly appointed between statistics and a social science department. Contrary to the understanding of most Statistics faculty members, these were not joint appointments in the traditional sense; instead their budgets reside in a separate CSSS budget controlled by the CSSS director, who reports directly to the A&S dean.

Core CSSS faculty with appointments in statistics have included Mark Handcock, Martina Morris, Peter Hoff, Sibel Sirakaya, Elena Erosheva, Adrian Dobra, and Tyler McCormick. Adrian Raftery was the founding director; the center is now directed by Thomas Richardson. PhD tracks have been established in nine PhD programs around the university based on CSSS courses. CSSS has helped to stimulate the rapid development of research at the interface between statistics and the social sciences nationally over the past decade.

Computational Finance. The CompFin program was established in 2004 by Doug Martin and now includes faculty in Applied Mathematics, Economics, and Finance. It has the following integrated academic focal points: portfolio construction and asset management, risk management, and computational methods. The curriculum includes not only traditional quantitative finance theory and methods but also cutting-edge methods such as modeling and use of fat-tailed skewed asset returns distributions, downside risk management, nonlinear correlations, and robust factor models. The computational focus is on the use of the

open source R programming language and modeling environment, with its many rapidly evolving open source packages for quantitative finance.

Faculty Research, Teaching, Publications, Honors (Partial List)

Julian Besag made seminal contributions to stochastic modeling, especially by modeling local specifications (for example via Markov random field models). This approach proved successful in many fields, including agricultural field trials, spatial epidemiology, and image analysis. Julian was elected a Fellow of the Royal Society in 2004.

Fred Bookstein's research has established the foundations of morphometrics, statistical methods that structure the space of measurements as rigorously as conventional methods structure the space of cases. Applications of this program, including the methodologies of partial least squares (from chemometrics) and shape coordinates (from morphometrics), have contributed to fields as diverse as human evolution, anatomical birth defects, capital punishment, and finite element analysis. He is coauthor of the textbook, "Virtual Anthropology" (2011) on the role of image analysis in general and morphometrics in particular across the sciences of human origins.

Adrian Dobra's research interests include graphical models, stochastic computing and multidimensional contingency tables, Bayesian statistics, applications in the social sciences, spatial epidemiology, genomics, and disclosure limitation.

Elena Erosheva studies the development and application of statistical methods to address issues in the social, behavioral, and health sciences, focusing on discrete data analysis, hierarchical, latent variable modeling, and Bayesian methods. Major contributions include developing the class of mixed membership models for multivariate data analysis that generalizes such special cases as the Latent Dirichlet Allocation model developed by computer scientists and the admixture model used in genetics.

Tilmann Gneiting has contributed to the theory of spatial and space-time covariance functions and developed (with Adrian Raftery) tools for assessment of probabilistic weather forecasts.

Peter Guttorp's research has focused on space–time models involving air pollution, climate, and hematopoietic stem cells. His work with Paul Sampson on nonstationary spatial covariance has been very influential. He has published two well-known monographs on stochastic processes: "Statistical Inference for Branching Processes" (1991) and "Stochastic Modeling of Scientific Data" (1995). Peter also contributed to two of the four assessment reports of The Intergovernmental Panel on Climate Change, established in 1988 by the United Nations Environment Programme and the World Meteorological Organization to provide assessments of the science of climate change. This panel received the Nobel Peace Prize in 2007.

Mark Handcock's work at UW was motivated largely by questions in the social sciences and demography. He has focused on the development of statistical models for the analysis of social network data, distributional comparisons, environmental statistics, spatial statistics, epidemiology, and labor economics. Recent applications have been to social relations networks with the objective of understanding the social determinants of HIV spread. He has also developed survey sampling methods for network sampling and for combining survey and population-level information. His book "Divergent Paths: Economic Mobility in the New American Labor Market" (2001), coauthored by Annette D. Bernhardt, Martina Morris, and Marc A. Scott, won the Lester Prize in Labor Economics.

Peter Hoff has developed a variety of statistical methods for multivariate data analysis, including methods for network analysis, covariance, and copula estimation. He has applied these methods to various problems in the biological and social sciences, in particular, international conflict and trade data. He has also worked on nonparametric Bayesian inference in the context of convex models and cluster analysis. His recent book "A First Course in Bayesian Statistical Methods" (2009) is in its second printing.

Cliff Lunneborg's three textbooks "Elementary Multivariate Analysis for the Behavioral Sciences: Applications of Basic Structure" (1983, Robert Abbott coauthor), "Modeling Experimental and Observational Data" (1994, 2000), and "Data Analysis by Resampling: Concepts and Applications" (2000), formed the core of the Statistics Department's undergraduate upper division elective curriculum.

Doug Martin has worked extensively on robust methods for signal processing in time series analysis. In recent years he has applied these methods to problems in finance, including portfolio optimization and risk management, options and derivatives, and data mining. He has coauthored the textbooks "An Introduction to Modern Portfolio Optimization with S+NuOPT, S-Plus, and S+Bayes" (2005) with Bernd Scherer and "Robust Statistics: Theory and Methods" (2006) with Ricardo Maronna and Victor Yohai.

Marina Meila's research interests include graphical probability models, machine learning, computational algorithms, and data mining. Specific topics include intransitivity in classification and choice, gravimetric inversion with sparsity constraints, manifold learning, and proteomics (interpreting the very complex signature of an amino acid sequence that is subjected to collision-induced dissociation).

Vladimir Minin works on developing statistical methods for phylogenetic reconstruction and for inferring demographic histories of populations from genomic data. His methodological work revolves around inference for partially observed stochastic models. He uses these stochastic models to study genetic diversity of rapidly evolving pathogens. Vladimir has worked on elucidating spatial patterns of recombination in the HIV genome, inferring population dynamics of influenza, and genome-wide scans for positive selection in the *E. coli* genome.

June Morita, with Eisenhower Foundation funding (1994–1996), brought week-long Quantitative Literacy Workshops to local elementary school teachers. These workshops were developed through the American Statistical Association. During 1996–2004, she was co-PI on the NSF-funded projects "Creating a Community of Mathematics Learners" and "Expanding the Community of Mathematics Learners" working with six local school districts to improve the level of mathematics understanding and the mathematics teaching effectiveness of elementary and middle school teachers.

Martina Morris's research is interdisciplinary, intersecting with demography, economics, epidemiology and public health, and statistics. Her current projects include the study of partnership networks in the spread of HIV/AIDS, the impact of economic restructuring on inequality and mobility, and the development of Relative Distribution methods for statistical analysis.

Don Percival is active in time series analysis, with emphasis on application of spectral and wavelet analysis to a variety of problems, including characterization of inaccuracies in atomic clocks, investigation of climate variability in the Arctic, and more recently, a depth/time analysis of temperature variations in an Australian subtropic dam. He also works on the time series analysis of Martian atmospheric pressure, Antarctic ice cores, atmospheric aerothermal turbulence, discharge behavior of rat motoneurones, heterogeneity measurements in sand on beaches, and subtidal coastal sea level fluctuations. He has coauthored the books "Spectral Analysis for Physical Applications: Multitaper and Conventional Univariate Techniques" (1993) and "Wavelet Methods for Time Series Analysis" (2000), both with Andrew Walden.

Michael Perlman contributes to multivariate analysis, notably in collaboration with Steen Andersson and David Madigan on the theory of graphical Markov models. They characterized the essential graph for equivalence classes of Markov models determined by acyclic directed graphs (=Bayesian networks) and introduced the AMP (alternative Markov property) for the wider class of chain graphs, which include both directed and undirected edges to model both causal and associative relationships. He served as editor of the *Annals of Statistics* during 1983–1985.

Adrian Raftery's research has focused on Bayesian model averaging, model-based clustering, and the statistical analysis of deterministic models, with applications to the social and environmental sciences. His 1995 *JASA* Discussion Paper "Inference from a deterministic population dynamics model for bowhead whales" with Geof Givens (UW PhD 1993) and Judy Zeh received the 1996 ASA Outstanding Application Award. Adrian served as Coordinating and Applications Editor of *JASA* in 1998–2000, was identified by Thomson-ISI as the most cited researcher in mathematics in the world for the decade 1995–2005, and was elected to the National Academy of Sciences in 2009.

Thomas Richardson works at the interface between causal and graphical models. His main contribution has been the development of a nonparametric graphical theory of path diagrams (which include directed and bidirected edges). This has included the construction of parameterizations, fitting algorithms, and

model selection procedures. His main collaborators have been Steffen Lauritzen (Oxford), James Robins (Harvard), and Peter Spirtes (CMU).

Paul Sampson's primary research topics have been spatial and spatio-temporal modeling in environmental statistics, Partial Least Squares methods in applied multivariate analysis, and geometric morphometrics, including the analysis of 3D MR brain images, in conjunction with his role as senior statistician for the Seattle Longitudinal Study on Alcohol and Pregnancy. He continues as the founding director of the department's Statistical Consulting Program.

Fritz Scholz retired from the Applied Statistics Group at Boeing in 2006 but continues teaching at UW. His research efforts include the theory of estimation, large sample theory, nonparametric statistics, software reliability, quantile estimation, risk analysis, bootstrapping, and tolerance analysis. He presented the Keynote Address "Statistics in Aviation: Celebrating 100 Years of Flight" at the 10th Spring Research Conference on Statistics in Industry and Technology at Dayton, Ohio.

Galen Shorack's research interests include empirical processes, asymptotic properties of rank statistics, linear combinations of functions of order statistics, robustness, and reliability. In addition to his book "Empirical Processes" (1986) with Wellner, he published the advanced graduate textbook "Probability for Statisticians" in 2000.

Werner Stuetzle has worked intensively on nonparametric methods in multivariate analysis, statistical applications of computer graphics, and scientific computing. He currently serves as Divisional Dean for the Sciences at UW.

Elizabeth Thompson continues to contribute to the development of methods for model-based likelihood inference from genetic data, particularly from data observed on large and complex pedigree structures both of humans and of other species, including inference of relationships among individuals and among populations. While at UW she has published two monographs on statistical genetics: "Pedigree Analysis in Human Genetics" (1986) and "Statistical Inferences from Genetic Data on Pedigrees" (2000). She was elected to the National Academy of Sciences in 2008.

Jon Wakefield has worked on hierarchical modeling in pharmacokinetics/pharmacodynamics and in spatial epidemiology. With respect to the latter, understanding ecological bias and overcoming this bias via outcome-dependent sampling is of particular interest. More recently, Jon has worked in genetic epidemiology and on various problems associated with high-throughput technologies.

Jon Wellner studies limit theories and inequalities for empirical processes, including preservation results for both Glivenko-Cantelli theorems and Donsker theorems. He has investigated semiparametric models with missing data and problems in shape-constrained estimation and has developed new test statistics for problems involving sparse normal means. In addition to "Empirical Processes" (1986) with Shorack, his books include "Information Bounds and Nonparametric Maximum Likelihood Estimation" (1992) with Piet Groeneboom, "Efficient and Adaptive Estimation for Semiparametric Models" (1993) with Peter Bickel, Chris Klaassen, and Ya'acov Ritov, and "Weak Convergence and Empirical Processes" (1996) with Aad van der Vaart.

Judy Zeh, following in Doug Chapman's footsteps, served as chairman of the Scientific Committee of the International Whaling Commission during 2000–2002.

Photographs of Z. W. Birnbaum, Ron Pyke, and Isobel and Doug Chapman appear below: