

Report of the  
University of Washington Department of Statistics Program Review

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### Executive Summary

The Department of Statistics has achieved a level of international, national, and institutional impact that places it among the top units at the University of Washington.

Since its inception, the department has pursued a distinctive vision: that *the development of statistical methodology* (tools) is the principal role of statistics as a discipline, and that this development of methodology must be *driven by applications*, with statistical theory employed to understand and evaluate the methodology. Additionally, the department has consciously positioned itself as a leader in the development of methodology that *exploits the increasing power and ubiquity of computers*.

The University of Washington has good reason to be proud of its Department of Statistics, which is an enormous asset to the institution. *The importance of this asset will increase dramatically in the coming decade*. The world of research, scholarship and teaching is becoming ever more quantitative. Disciplines ranging from the physical and life sciences to the humanities and social sciences are grappling with exploding databases and complex systems that require sophisticated analyses grounded in computational and theoretical statistics. The Department of Statistics is analogous to the Department of Computer Science & Engineering in that many units on campus in which we take great pride – units that are essential to our future as a major national research university – are increasingly dependent on the department's knowledge, expertise, and excellence. This dependence is far more than a mere reliance on a "service" provided by the department, for statistics, again analogous to computer science, is a *transforming discipline*, where true intellectual partnerships fundamentally change the nature of scholarship. There are many examples of this already in play at the University of Washington. To cite just one, Elizabeth Thompson's participation in the NSF-sponsored Mathematical Biology Program has significantly changed the way in which participants think about the field – a shift from a deterministic to a probabilistic point of view that has enriched all aspects of the program. This and other recent accomplishments only hint at the potential for the future. The University of Washington is positioned beautifully to take advantage of the central and transforming role that statistics will increasingly play in a wide variety of disciplines (and in a wide variety of interdisciplinary endeavors) in the coming years.

It is a source of enormous concern to the review committee, therefore, that the current situation of the Department of Statistics is precarious. Extreme opportunity is coupled with extreme vulnerability, yielding two possible futures. the bright future, in which the University of Washington makes relatively modest additional investments in the Department of Statistics and is able to capitalize on the department's outstanding accomplishments and to utilize its collaborative culture to strengthen and transform a wide variety of important disciplines; and the dark future, in which the momentum of the University's past investments and the department's past accomplishments is lost, and we fail to seize the opportunities for leadership with which we are presented. Among the key issues that concern the review committee are

*faculty retention, space, and critical mass.* We discuss each of these in detail in the body of the report, and provide only a summary here

*Faculty retention.* The University of Washington Department of Statistics, because of the excellence and visibility of its faculty coupled with their notoriously low salaries, has become a happy hunting ground for organizations seeking to improve their statistics programs. Susceptibility is increased by poor facilities (the space allocated to the National Research Center for Statistics and the Environment was described as “pathetic” and “shameful” by the two external review committee members) and difficulty in obtaining sabbatical leaves. During the very brief history of this review committee, four different Statistics faculty members received serious external entreaties! The department’s small size (11.5 FTE) means that the loss of even one key faculty member would constitute a significant setback. It also means that the cost of addressing the worst problems is not prohibitive on an institutional scale.

*Space.* The department is cramped to the extent that its performance is significantly impacted. (7,400 ASF and 640 ASF/FTE, versus roughly 14,000 / 825 at Stanford and roughly 22,000 / 880 at Berkeley ) A key component of the department, the National Research Center for Statistics and the Environment, is located remotely, for apparent want of 1,000 ASF in Padelford Hall. A highly valued campus-wide asset and service, the Statistical Consulting Program, has no permanent space. The location of the department on the periphery of campus is particularly deleterious to a program that thrives on collaboration and is intellectually central to so many other fields.

*Critical mass.* At Stanford – a campus particularly known for achieving success with small programs – the Department of Statistics has 17 permanent faculty members. At Berkeley, there are 22. The University of Washington Department of Statistics has 11.5 FTE faculty – essentially unchanged from 11.33 at the time of the previous review a decade ago. That the University of Washington Department of Statistics can achieve a top-ten national ranking and significant institutional impact with 11.5 FTE is a near-miracle, but the review committee simply does not see this as sustainable, particularly given the increasing centrality of the field to the future of the institution.

The review committee urges the University of Washington to *choose the bright future*, making the relatively modest additional investments in the Department of Statistics that are necessary if we are to preserve and enhance the department’s excellence and capitalize on the potential of statistics – and of this department in particular – to transform a wide variety of important disciplines. In the body of the report, we propose four principal issues for the University to address:

*Establish the Center for Statistics and the Social Sciences as described in the University Initiatives Fund proposal.* This initiative has the clear potential to transform the social sciences at the University of Washington, to transform the teaching of statistics in the social sciences, to generate outstanding research in statistics, and to create some badly needed “breathing room” for the department in terms of faculty positions, staff positions, student support, and space.

*At the discretion of the department, expand the department’s campus-wide instructional role at both undergraduate and graduate levels.* The establishment of the Center for Statistics and the Social Sciences will dramatically increase interactions between Statistics and the social sciences, but the opportunities are far broader than this. Providing Statistics with an expanded campus-wide instructional role not only would improve the teaching of statistics campus-wide, but also would provide Statistics with the entitlement for a small number of additional faculty who could be deployed to build high-bandwidth channels with additional disciplines.

*Strengthen the foundations of the field by encouraging other Mathematical Science units to hire in the core of the stochastic and data analytic subjects.* While we applaud the applied and computational orientation of the department, additional strength is required in the more mathematical aspects of the

field Not all of this strength, though, needs to be housed solely within the Department of Statistics (Careful joint appointments can be a marvelous form of social engineering )

*Address retention issues aggressively.* Salaries, sabbatical policies, and facilities all are significant issues. One does not need to be the absolute leader in each of these areas, but one can ill afford to be a *laggard* in each, which is arguably the case.

The Department of Statistics is, in many ways, a model for the rest of the University: a small unit that has achieved national and international distinction coupled with multifaceted institutional impact, through a clear vision, outstanding leadership, and consistent effort. The department has done all that it possibly can, and more than we have any right to expect. Additional investment will pay exceedingly high dividends for the University of Washington.

### **Process**

The review committee was formed and charged in August 1998 by Dean of the Graduate School Marsha Landolt, Acting Dean of the College of Arts and Sciences David Hodge, and Dean of Undergraduate Education Fred Campbell. (See Appendix A.)

The review began in earnest in early October, with the delivery of the department's self-study. A subsequent meeting of the internal members of the committee with University and College administrators framed the review. Participants in this meeting, in addition to those above, included Associate Dean of the Graduate School for Academic Programs John Slattery, Assistant to the Dean of the Graduate School Augustine McCaffery, Associate Provost for Academic Planning Debra Friedman, Divisional Dean for the Sciences Gary Christian, and Associate Dean of Undergraduate Education George Bridges. (See Appendix B.)

During late October and early November the internal members of the committee met with a number of individuals including department chair Werner Stuetzle, current and past graduate program heads David Madigan and Elizabeth Thompson, Divisional Dean for the Sciences Gary Christian, Acting Dean David Hodge, Center for Statistics and the Social Sciences UIF proposal coordinator Adrian Raftery, and graduate student representatives Beatrix Jones and Greg Ridgeway. (An addendum to the self-study was provided in response to certain questions, see Appendix C.)

The information gathered during this process, plus knowledge gained through committee member Tom Daniel's concurrent service as a member of the Statistics Chair Review, shaped the agenda for the formal review meeting, which took place on November 23 and 24. (See Appendix D.)

In mid-December, prior to the completion of this formal report, committee members Tom Daniel and Ed Lazowska met in an open forum with Statistics students, staff and faculty to present our major findings and recommendations.

The members of the review committee join in thanking the many participants in the review process for their contributions. It was a pleasure to review such a sound program, focusing on ways to further increase its excellence.

### **Appraisal of the Department**

This has been an impressive decade for the University of Washington statistics enterprise. In the 1993 National Research Council rankings, both the Statistics and Biostatistics departments were placed among the top ten statistics programs in the nation, and they were by far the leaders in the "most improved since 1988" category of that survey. Our review revealed continued strong performance by the Department of

Statistics. *With reasonable support from the University, there is every reason to believe that the department can move into the top five nationally within the next few years.*

It is said that there are a hundred reasons for failure but only a few paths toward success. At the University of Washington, success for the Department of Statistics has been based on a strong original conception of what a statistics department should be in a modern university, and then consistent hard work in carrying out that conception.

The department has positioned itself as a leader in the development of statistical methodology that exploits the increasing power and ubiquity of computers: graphics/visualization, Bayesian statistics, Markov Chain Monte Carlo methods, spatial statistics, statistical genetics, etc. The choice to focus on *the applications-driven development of computationally-oriented statistical methodology* was far from an obvious one in the late 1970's, when the department was formed. And it is far from the universal choice today. But it has proven to be an extraordinarily astute choice, as implemented at the University of Washington – and a choice that holds great promise for the future. The department rapidly achieved national and international distinction for its research, while simultaneously establishing a strong record of campus impact for its collaborative interdisciplinary research, undergraduate and graduate teaching, and statistical consulting, all of which were mutually reinforcing under the vision.

The department's vision, and its success, are tributes to a number of individuals: to Michael Perlman, the founding chair; to Douglas Martin and Galen Shorak, his senior partners from the outset; to a succession of excellent chairs and excellent faculty members; and to the University of Washington's outstanding Department of Biostatistics, which from the outset viewed Statistics as a sister program and as an opportunity for the University, rather than as a threat. Working together, they have brought the University of Washington's Department of Statistics to the edge of greatness.

One of the distinguishing characteristics of the department, and a major strength, is the extensive involvement of the faculty in collaborative research with colleagues in a wide range of disciplines. These are genuine collaborations that go far beyond the use of statisticians as support personnel. Indeed, as we suggest below, the contributions of this department are transforming other units on campus, making them more quantitative and more competitive. Some examples include Adrian Raftery and David Madigan's interactions with the social sciences, Elizabeth Thompson's interactions with the biological sciences, Werner Stuetzle's interactions with Mathematics and Computer Science & Engineering, and Peter Guttorp's National Research Center for Statistics and the Environment. This kind of collaborative research not only invigorates Statistics by motivating the development of new methodology and new theory, but also greatly benefits the other disciplines. The committee was impressed with the high level of statistical sophistication around the UW campus, and with the visibility and popularity of the Departments of Statistics and Biostatistics.

Statistics has consistently made strong appointments. The Assistant and Associate Professors – Tilmann Gneiting, Thomas Richardson, and David Madigan – are an impressive group. If there is any deadwood in the faculty we were certainly not able to see it. There is a downside to this record of success: as we will discuss later, the outstanding faculty is a ripe target for other institutions seeking to improve their statistics programs. The department is highly vulnerable to raiding because of its low salaries, stagnant size (there has been no growth in the past decade), and poor facilities. In addition, the department's small size (fewer than a dozen FTE) means that the loss of even a single key faculty member would constitute a significant setback.

The department's graduate program competes with Stanford, Berkeley, and Chicago for the top echelon of applicants. This has resulted in a lively and diverse body of graduate students. The graduate program is well organized and well matched to the strengths of the faculty. Ph.D. theses are of high quality, and graduates compete successfully in the market for academic and research positions. The principal negative

notes concern infrastructure. space is badly cramped in Padelford Hall, without good common rooms or desks for visitors (who are a major benefit to the education of students at Stanford and Berkeley ) In addition, the culture regarding TAing causes students to have little opportunity to assist in advanced courses, an important aspect of graduate education at most schools.

The department takes undergraduate education seriously and has invested significant effort in its service courses. It also has played a major role in developing the new undergraduate program in Applied and Computational Mathematical Sciences (ACMS), and in attracting the new NSF VIGRE grant. Emphasizing the ACMS major over a Statistics major is a sensible policy, and one that has worked well at Stanford. Given the small size of the department it seems really the only feasible plan right now, although with even a few more positions the University might profit from a more aggressive undergraduate Statistics major.

As already mentioned, infrastructure is a major limiting factor. The Department's space is insufficient to support its activities. The separation from the National Research Center for Statistics and the Environment (NRCSE) is particularly unfortunate. The quality of the NRCSE space is pathetic and has a negative impact on the functioning of the Center. The department's current total space allocation appears to be near the bottom of the scale nationally. A desirable long-term goal would be not only more space, but also a location nearer to the collaborators who are so central to the highly effective conception of Statistics at the University of Washington.

The department has managed to avoid various pitfalls that have dogged the statistics enterprise at some other schools. A strong positive bond has been forged with UW's outstanding Biostatistics program. To a great extent the department has avoided both over-specialization and also competition between fiefdoms. The spirit of the department is excellent, another testimony to good leadership. There is a pervasive feeling of camaraderie and mutual respect, and it seemed to the reviewers to be a good place to do good work in statistics. The review committee, and the overwhelming majority of the faculty, are enthusiastic about Werner Stuetzle's current chairship, and his dedication both to the department and to the University.

The University of Washington has good reason to be proud of its first-class effort in statistics. Statistics is currently a relatively small field, but it is one that has grown steadily in importance in dozens of intellectual areas. The University's original decision to devote some real resources to Statistics has proved a wise one over the past two decades. The review committee feels that an increase in support is now both warranted and necessary, and is likely to prove a wise investment once again. The department could not have done more with the resources that have been allocated to it, and, as we shall discuss, there is much more of great importance to be done.

### **Statistics as a Transforming Discipline: Future Roles and Centrality**

The Department of Statistics has achieved a level of international, national, and institutional impact that places it among the top units on campus. Accordingly, our review focuses not on the identification of problems that are in need of correction, but rather on the future role of the discipline of statistics, and on the steps that must be taken if we are to ensure that the University of Washington will have the continued benefit of a high-impact program.

The world of research, scholarship and teaching is becoming ever more quantitative. Increasingly, computational and mathematical tools are being brought to bear on wide range of issues. Disciplines ranging from the physical and life sciences to the humanities and social sciences are grappling with exploding data bases and complex systems that require sophisticated analyses grounded in computational and theoretical statistics. The Department of Statistics is analogous to the Department of Computer Science & Engineering in that many units on campus in which we take great institutional pride – units

that are essential to our future as a major national research university – are increasingly dependent on the department’s knowledge, expertise, and excellence: units in the social sciences, physical sciences, life sciences, engineering, ocean and fisheries sciences, forest resources, and many more.

Naturally, one way in which this dependence manifests itself is through pressures on graduate and undergraduate teaching performed by the department. Statistics forms part of the core requirement for a wide variety of majors across campus (for example Applied and Computational Mathematical Sciences, Biology, Zoology, Computer Science & Engineering, the social sciences), many of which are growing at high rates. Thus, to have effective education of our students, we will require strong leadership from departments such as Statistics.

But the dependence of diverse disciplines upon the knowledge, expertise, and excellence of the Department of Statistics is more than a mere dependence on a “service” provided by the department. Statistics, again analogous to computer science, is a *transforming discipline*. In the NSF-sponsored Mathematical Biology Program on campus, Elizabeth Thompson has significantly changed the way in which participants think about and do research in the field of biology. She came into a program dominated by “determinists” – people who think mathematical biology is only about highly predictive models with precisely known parameters and equations that can be solved analytically or numerically. There was, in a sense, a resistance to anything statistical in this program. Through her thoughtful involvement (counseling, advising students, frequent comments in seminars), there has been an enrichment of quantitative problem solving for a host of biological problems. The faculty PI’s of the training grant now commonly use Markov Chain Monte Carlo models in problems ranging from conservation biology to protein biophysics; they support a number of students interested in statistical genetics; they now worry about statistical models in their own work. Another particularly fruitful role of the Department of Statistics lies in its strong ties with Biostatistics in the Health Sciences. These two outstanding departments have historically co-taught courses, pursued joint research projects, and encouraged joint appointments. The recent theft by Biostatistics of Michael Boehnke from the University of Michigan significantly strengthens the University of Washington’s national profile in statistical genetics, and apparently is largely responsible for Elizabeth Thompson’s decision to remain at UW. And in the social sciences, Adrian Raftery’s collaborations have strengthened the quantitative approaches used by investigators, providing a deeper understanding of demographic data bases and stimulating significant and highly fundable research. For brevity we omit many other examples.

*These recent accomplishments only hint at the potential for the future.* Statistical genetics and mathematical biology, for example, are only two of many aspects of “computational biology” (very broadly defined) where an intellectual partnership with Statistics can play a transforming role. There are myriad additional opportunities in the social sciences, and in the environmental sciences. The field of computational finance could provide a wonderful partnership with the School of Business. Wavelets and datamining are two techniques deeply rooted in statistics that have the potential to transform many fields in engineering and the sciences.

## **Two Futures**

Niels Bohr, Nobel laureate in Physics, once said “To predict is difficult – especially the future.” This difficulty is particularly present in the case of the University of Washington Department of Statistics.

The department has accomplished an enormous amount in its relatively brief history: it has developed wonderfully, and the care and thoughtfulness that went into its evolution are remarkable.

This success has positioned the University of Washington beautifully to take advantage of the central and transforming role that statistics will increasingly play in a wide variety of disciplines (and in a wide variety of interdisciplinary endeavors) in the coming years.

But, as we shall describe, the situation is highly fragile, and this has to be of concern to the University community. Luckily, the University administration has the power to deal with many of the concerns to be listed.

We thus see both opportunity and vulnerability, yielding two possible futures. There is the bright future, in which the University of Washington makes relatively modest additional investments in the Department of Statistics and is able to capitalize on the department's outstanding accomplishments and to utilize its collaborative culture to strengthen and transform a wide variety of important disciplines. And there is the dark future, in which the momentum of the University's past investments and the department's past accomplishments is lost, and we fail to seize the opportunities for leadership with which we are presented.

Among the key issues that concern the review committee:

*Faculty retention.* The University has to think seriously about the issue of the retention of its fine Statistics faculty. Virtually all North American departments would be delighted to be able to hire most any of them. To review a few particular cases: Julian Besag is a star on the international scene who has made deep contributions to the field of spatial statistics in particular. He is quite capable of obtaining a professorship in the United Kingdom and needs to be directed away from doing so. (An offer from Duke was countered several years ago.) Peter Guttorp works in most everything, theoretical and practical. It was an amazing coup that he was awarded the contract for establishing a National Research Center for Statistics and the Environment: he beat out the National Institute of Statistical Sciences in particular. He also was one of the PI's who brought the VIGRE award to the University of Washington, for which there also was very substantial competition. Yet, Guttorp's salary is low, he was recently denied a sabbatical request, and the space allotted to the NRCSE is, as noted above, pathetic. David Madigan is one of the young stars of the field, and works in the highly topical area of graphical models, which both the academic and industrial worlds are currently highlighting. Madigan recently declined an offer from Bellcore, but now both AT&T Research and Lucent Technologies, where the facilities are among the best in the world, are actively pursuing him. Werner Stuetzle works on hard problems on the interface of statistics, mathematics, and computer science that are of substantial practical importance; a personally and professionally attractive offer from ETH Zurich was countered as this report was being written. Elizabeth Thompson is one of the premier researchers in statistical genetics, and arguably the leading female statistician in the world. Her salary is low, and the review committee's attention was drawn several times by others to the University's apparent inability to find .5 FTE for a strong young woman in statistical genetics with whom Thompson was eager to collaborate. Although Thompson has recently chosen to remain at the University of Washington (over two external overtures) due to a commitment she made to Michael Boehnke when he was being recruited from the University of Michigan by the Department of Biostatistics, the University of Washington should not take advantage of her and ignore her salary situation. Jon Wellner is amazing: laboring almost in isolation, he maintains a very high quality research program in theoretical statistics, providing the foundational material that the students need as part of their education and that the more applied faculty members need in their research. Cornell has asked Wellner to interview during Winter Quarter. Because of his fine research record it will be no surprise when a formal offer arrives. Adrian Raftery was recently retained over an offer from the London School of Economics. In order to retain faculty, one does not need to be the absolute leader in salaries, in facilities, in sabbatical policies, etc. But one can ill afford to be a laggard in *all* of these, which is arguably the case.

*Space.* The department is cramped. Stanford devotes roughly 14,000 (brand new) square feet to Statistics, and Berkeley devotes roughly 22,000 square feet – 825 and 880 ASF/FTE, respectively. UW devotes 7400 square feet, 640 ASF/FTE. A key element of the department – NRCSE – is located at a remote site, which badly reduces its integration with other departmental programs, and this remote space is described one of the external committee members as “shameful given the high level of energy that the group has and the amount of overhead that it must be bringing to the campus.” (The adjective “pathetic,” used twice

previously, was contributed by the other external committee member ) Finally, while the discipline of statistics is increasingly central to many others, the location of the department is on the periphery of the campus, far removed from key collaborators. (Not the case at Berkeley or Stanford.)

*Critical mass.* A critical threshold is needed for a department to thrive. For example, the demographics have to be appropriate if there is to be a functioning committee structure, an appropriate set of courses offered, and the necessary institutional responsibilities fulfilled. There are few intellectual subjects that do not benefit from a consideration of the concepts and techniques of statistics, which creates significant opportunities, and also significant demands. Stanford has 17 permanent faculty members in Statistics. Berkeley has 25.

## **Principal Recommendations**

*Establish the Center for Statistics and the Social Sciences as described in the University Initiatives Fund proposal.* This initiative has the clear potential to transform the social sciences at the University of Washington, changing the nature of research and significantly increasing the level of research funding. It also has the clear potential to transform the teaching of statistics in the social sciences, creating students at both the undergraduate and graduate level who are far more capable quantitatively, and thus far better prepared to serve their fields in the next century. Most importantly from the point of view of the review committee, this initiative has the clear potential to generate outstanding research in statistics, and to create some badly needed “breathing room” for the department in terms of faculty positions, staff positions, student support, and space. (It is *essential* that the space needs of the Center be met, that this space be contiguous to the rest of the department, and that NRCSE be integrated.)

*At the discretion of the department, expand the department’s campus-wide instructional role at both undergraduate and graduate levels.* The establishment of the Center for Statistics and the Social Sciences will dramatically increase interactions between Statistics and the social sciences, both in research and in education. But, as we have described earlier, the opportunities are far broader than this. Providing Statistics with an expanded campus-wide instructional role would first of all improve the teaching of statistics campus-wide. (Note that Statistics has a strong reputation for education, and a strong reputation for interdisciplinary work and for the integration of research and education. Students in other fields who take statistics courses taught by the Statistics department will not be learning irrelevancies!) Secondly, it would provide Statistics with the entitlement for a small number of additional faculty who could be deployed to build high-bandwidth channels with additional disciplines. The review committee strongly urges that Statistics faculty be given the opportunity to teach statistics courses offered by the Center for Quantitative Science; we were not impressed with the vision of statistics teaching there. The review committee also suggests that discussions with the Department of Psychology be initiated; we understand that there have been some retirements of quantitatively-inclined faculty in Psychology and that a real partnership might be forged here.

*Strengthen the foundations of the field by encouraging other Mathematical Science units to hire in the core of the stochastic and data analytic subjects.* While we applaud the applied and computational orientation of the department, additional strength is required in the more mathematical aspects of the field. Not all of this strength, though, needs to be housed solely within the Department of Statistics. Mathematics, for example, might do well to hire additional faculty of an appropriate orientation in mathematical statistics, probability, stochastic calculus, and similar fields; done intelligently, this would build bridges to statistics and other fields, increase research funding, and create new educational opportunities and partnerships. Careful joint recruiting and joint appointment of new hires might be an excellent way to effect some social engineering; there are a number of departments in addition to Mathematics where joint appointments could yield wise partnerships.



*Address retention issues aggressively* Salaries, sabbatical policies, and facilities all are significant issues Ed Lazowska has discussed the salary situation with the Acting Dean, who clearly has a thorough comprehension of the complexities of the situation; in essence, periodic responses to external offers in a generally strong department with generally low salaries has led to a destructively wacky salary structure. We don't understand why there should be a sabbatical problem, since our understanding is that, across the University, sufficient quarters exist. Space is a very serious issue that bears heavily not only on retention, but also on overall effectiveness. We strongly urge short-term measures including improvements to the NRCSE space and the allocation of modest amounts of additional space in Padelford, e.g., to better house the Statistical Consulting Service. And we strongly urge a longer-range plan to locate an expanded department in a sufficient amount of contiguous space somewhere closer to the center of the campus. The institutional payoff will be very significant.

### **Additional Findings and Recommendations**

*The graduate program.* The Department of Statistics has a strong and successful graduate program We did, however, identify some areas where improvements are possible. We noted earlier that the department competes with Stanford, Berkeley, and Chicago for the top echelon of graduate applicants. The department currently is executing several elements of a recruiting strategy designed to increase its yield, a strategy which we endorse (and which we hope the Graduate School will help to fund, because a department this small has very little "internal skim" that can be directed to such efforts). We heard in person and in writing from a number of recent graduates of the Ph.D. program, all of whom are highly satisfied with the education they received – an impression borne out by the "exit surveys." Students in the early years of the program, though, express considerable anxiety related to the "matchmaking process" in which students pair themselves with research advisors. Essentially, the culture of the department discourages TAing after the first year, but because of their diverse backgrounds, many students really aren't prepared to commit to an advisor at that time, and also they have not yet gained sufficient (and sufficiently diverse) instructing experience. Our suggestion is that the department create some 10-hour TAships, facilitated by the VIGRE grant, and that students be encouraged to hold these well into their graduate careers. We also would encourage that generally greater attention be paid to the early mentoring of graduate students. We suggest that the graduate students themselves take responsibility for increasing the level of informal interaction among themselves and with the faculty. Spontaneity is made very difficult by the crummy facilities available to the department, so we encourage student-organized (and departmentally-underwritten) seminars, teas, annual retreats, refreshments before seminars (instead of after), etc. Finally, while recognizing that there are only so many hours in the day, we suggest that the department devote additional attention to its Masters students; the strong Ph.D. orientation of the graduate program can cause Masters students to feel adrift, not knowing what they should do if their goal is to expeditiously graduate with a Masters degree. We emphasize that this is a faculty that cares deeply and thinks carefully about graduate education.

*The Applied and Computational Mathematical Sciences undergraduate program.* The Departments of Applied Mathematics, Computer Science & Engineering, Mathematics, and Statistics have devoted considerable energy to this program, and Randy LeVeque is providing fine leadership. The program has attracted a number of majors in its short lifetime, and the collaboration was important to the recent NSF VIGRE award. In concept, the program makes eminent sense, and is quite similar to a successful program at Stanford. Some tuning is required, however. An unfortunate number of the students in the program appear to be "computer science wannabe's" pursuing the *Discrete Mathematics and Algorithms* track, while the other tracks are generally under-populated. We suggest three separate initiatives. First, make each of the existing tracks more attractive through a variety of strategies: examine their intellectual coherence; ensure that they are described/promoted well; examine their requirements, particularly in the context of their suitability for dual-majors. Second, introduce additional tracks specifically designed for dual majors in other fields; as just one example, consider a *Statistical Finance* track whose requirements heavily overlap the requirements of the Economics and/or Business major. Third (and of less urgency),

without destroying what is a well-designed *Discrete Mathematics and Algorithms* track, charge the Department of Computer Science & Engineering to see if there is a way to better-serve the needs of the “computer science wannabe’s.”

*Undergraduate and graduate service courses.* The department has a fine record here, and clearly intends to do more through the Center for Statistics and the Social Sciences. We have only two suggestions, both of which involve the World Wide Web. First, readily-available materials should make it easy for students and their advisors to select the appropriate course. Second, there should be greater standardization among consecutive offerings of specific courses. (This should reduce the instructor and TA workload, as well as better-serving students.) Having a Lecturer who could focus full attention on the coordination of these courses would be an enormous asset; it is not something that a small department can afford “on the skim.”

*Research funding.* We address the issue of the vulnerability of research funding only because it was prominent in the self-study. It is indeed the case that larger grants imply greater vulnerability to the whims of funding agencies. The alternative, alas, is diminished support for research. We see no sign whatsoever that the faculty is compromising its research quality in order to attract funding. Our only suggestion is to focus on diversification – additional agencies and additional programs. As the department grows, and as it extends its interdisciplinary tentacles in various directions, this problem should diminish.

*Computing facilities and technical support staff.* Computing facilities struck us as marginal, and we also would strongly encourage the central funding of a second technical support staff member devoted to the department. (The Berkeley department has four.) We further suggest that the graduate students work with the faculty to apply for Student Technology Fee funding for equipment and student staffing funding for a research/instructional lab upgrade.

#### **Appendices (attached)**

**A: Charge letter and *Guidelines for Program Review Committees*, August 1998**

**B: Secondary instruction letter, October 1998**

**C: Addendum to the *Self-Study Document***

**D: Agenda for the formal review meeting, November 1998**

# UNIVERSITY OF WASHINGTON

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August 7, 1998

## Department of Statistics Program Review Committee

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Dear Colleagues:

We appreciate very much your willingness to serve on the committee to review the Bachelor of Science, Master of Science, and Doctor of Philosophy degree programs offered by the Department of Statistics, in the College of Arts and Sciences, at the University of Washington. Professor Edward Lazowska, has agreed to chair the review committee. The review will be conducted jointly by the Graduate School, the College of Arts and Sciences, and the Office of the Dean for Undergraduate Education. The Graduate School Academic Programs Office will coordinate the review.

The last comprehensive review of the Department of Statistics degree programs was completed in November 1989. At that time, the Board of Regents authorized the change from provisional to continuing status for the B.S., M.S., and Ph.D. degree programs, with the next review to be scheduled in the 1998-99 academic year.

## Committee Charge

The committee's charge in this review is to assess the quality of the degree programs and provide the faculty with constructive suggestions for strengthening the programs. A copy of the Graduate School *Guidelines for Program Review Committees* is enclosed for your review.

Some years ago, the University established the systematic review on a ten-year cycle of all degree programs with continuing status. These reviews provide the University with a clearer understanding of each program's quality, educational value, role within the University and community, role within the academic discipline, and resource requirements. The benefits of such periodic reviews justify the effort invested by the academic unit. The results of this review will be of major importance in the planning efforts of the Department, the College of Arts and Sciences, the Graduate School, and the University.

## Self-Study and Site Visit

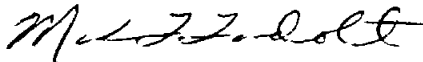
The Department is preparing a self-study on the degree programs that will be submitted to the Graduate School by September 30, 1998. The Academic Programs Office is currently working to establish review site visit dates. The Academic Programs Office staff will work with the committee and the Department to establish an agenda for the review site visit. The committee will meet with faculty, students, staff, and the deans of the College of Arts and Sciences, the Graduate School, and the Office of the Dean for Undergraduate Education. External constituents may also be included.

Review Committee Report

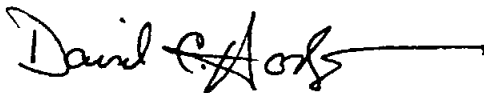
Within six weeks after the site visit, we would appreciate receiving your written findings and recommendations regarding the degree programs. Your report will be transmitted to the Department of Statistics for review and comment. The College of Arts and Sciences Council and the Graduate School Council will consider your report and recommendations, along with the Department faculty's comments. Professors Lazowska, van Belle, and Daniel will be invited to participate in these discussions. Relying on the advice of the faculty councils, we will then transmit recommendations regarding the review to the Provost for consideration and action.

We look forward to working with you on this important review. Please contact John Slattery, Associate Dean for Academic Programs, or Ms. Augustine McCaffery, Assistant to the Dean in the Academic Programs Office, at (206) 685-3519 whenever you may have questions or if you need further information concerning the program review.

Sincerely,



Marsha L. Landolt  
Dean  
The Graduate School



David C. Hodge  
Acting Dean  
College of Arts and Sciences



Frederick L. Campbell  
Dean  
Office of Undergraduate Education

Enclosure

c: Richard L. McCormick, President  
Lee L. Huntsman, Provost  
Debra Friedman, Associate Provost  
John T. Slattery, Associate Dean, Academic Programs  
Gary D. Christian, Divisional Dean, Sciences  
George S. Bridges, Associate Dean, Undergraduate Education  
Linda Richter, Assistant to the Vice Provost  
Le'a Kent, President, GPSS

MLL·JBS:FLC:am

## GUIDELINES FOR PROGRAM REVIEW COMMITTEES

The following guidelines have been developed by the Graduate School in consultation with the schools and colleges. Please feel free to contact the Academic Programs office in the Graduate School or the deans involved in the review, whenever there are questions

### Information Gathering

- 1 The committee should feel free to request from the unit under review any information it needs beyond the self-study document.
- 2 Because of the limited time available for the site visit, the on-campus committee members should hold prior discussions to formulate issues and specific questions for the outside visitors. These should be communicated to the visitors in advance if possible. The on-campus committee should also meet with the unit chair or other key faculty, staff and students prior to the site visit.
3. The Academic Programs office in the Graduate School, in consultation with the review committee and the unit chair, is responsible for arranging the site visit schedule. The committee should feel free to discuss the schedule with the Academic Programs office and the unit chair to see that its preferences are met. The committee should meet with both faculty and students broadly representative of the programs under review.
- 4 If issues arise during the site visit which cannot be resolved in the limited time available, the on-campus committee members may wish to pursue them at a later date.

### Committee Report

- 5 The report should be endorsed by **all** committee members. In addition, the visitor(s) may wish to submit as appendices separate letter(s) summarizing their observations. Such letters are very helpful because they provide an expert external perspective.
- 6 The committee report should be submitted to the Graduate School within six weeks after the site visit.
- 7 The report should contain the following elements:
  - a Summary of process. What was reviewed, when, and how. Who was interviewed, what facilities were examined.
  - b. Findings. Present strengths and weaknesses of the programs, history relevant to the present status, directions in which programs are heading.
  - c. Recommendations. How may strengths be maintained, and weaknesses corrected?

In organizing its findings or recommendations, the committee may find useful as a reference the enclosed "Important Characteristics of Degree Programs."

8. Both praise and criticism are normal and valuable features of reports. To be effective, the report should be frank. The more constructively criticism is phrased, however, the more effective it is likely to be. It is useful if the report begins and ends positively, and avoids pejorative adjectives or censure of individuals. Where findings are tentative or impressionistic, this should be stated. The committee may ask to meet with the deans if there is sensitive information to be conveyed which would be inappropriate in the report.
- 9 If the faculty of the unit reviewed perceives major errors in the report, and makes this view known to the committee, the committee should carefully consider the possibility of revision. The final decision on content, however, rests with the committee.

## IMPORTANT CHARACTERISTICS OF DEGREE PROGRAMS

### Quality

Academic Training of Faculty  
National Reputation of Faculty  
Research Productivity of Faculty  
Teaching Effectiveness of Faculty  
Academic Standards and Degree Requirements  
Qualifications of Entering Students  
Scholarly Significance of Dissertation Research  
Student-Faculty Interaction  
Program Leadership and Organization  
Collegial Atmosphere and Faculty Welfare  
Affirmative Action in Faculty Hiring

### Value to Students

Admissions Policies, including Affirmative Action  
Advising and Concern for Student Development  
Time to Degree and Fraction Who Complete Degrees  
Student Evaluation of Program  
Achievements, Knowledge, Skills at Degree Completion  
Placement of Graduates  
Accomplishments of Graduates  
Impact of Program on the Community

### Role within University

Purposes of Program  
Need for Program at the University  
Relationship and Service to Other Programs  
Impact of Curriculum and Research on Other Fields  
Appropriateness of Organizational Setting

### Resources

Financial Support from the University  
External Support  
Availability of Assistantships to Students  
Library  
Laboratory Equipment and Facilities  
Computer Facilities  
Staff

### Objectives

Relevant History  
Present Directions  
Future Goals, and Ability to Achieve Them

UNIVERSITY OF WASHINGTON

*The Graduate School*

*200 Gerberding Hall*

*Box 351240*

*Seattle, Washington 98195-1240*

Telephone: (206) 543-5900

Fax: (206) 685-3234

October 14, 1998

Edward D. Lazowska, Professor and Chair  
Department of Computer Sciences and Engineering  
Box 352350

RE: 10-year review of Statistics

Dear Ed:

I am writing to summarize our discussion of items to be considered in your review of the degree programs in the Department of Statistics. As generally agreed at the meeting, this seems to be a strong department within its discipline that is very interactive with other units on campus. If your review should reach a conclusion consistent with this statement, it is important that it include suggestions of what the University can do to maintain and build on its quality. Some of the work in the department may merit specific mention as they coincide with current University initiatives and priorities. The specific items that were discussed follow.

General departmental issues:

1. The department notes that the current NSF awards to individual investigators are small, in the range of \$40,000 - \$50,000. This situation has forced several faculty to engage in multi-investigator grants with higher award ceilings. The impression from the self-study is that this jeopardizes the department. What is the risk? Does the department (or the review committee) have a plan to deal with the risk?
2. The department appears to have considerable impact on campus, particularly given its size, through collaborations, consulting and other efforts. This appears to be made possible by the dedication of the department to undertaking statistical problems relevant to the analysis of data in actual research contexts. The self-study claims that many departments of statistics are adopting this orientation and that this department is at the vanguard of the movement. The external reviewers should evaluate this claim.
3. The department appears to have an impact that touches international, national, state and Puget Sound interests. It would be helpful to consider this impact and its importance to the state and region.
4. The department overlaps with other statistical units on campus: QERM, Biostatistics and perhaps CQS. Although this may be too broad an issue for you to address in any depth, the committee may comment on the value of so many units with overlapping interest.
5. The department can be viewed as an untested model – independent scholars who form a cohesive unit with interests in one another's activities while maintaining broad interactions with scientists from a variety of disciplines. Does the model work? Should it be applied to other programs? What are the necessary departmental or personal qualities for the model to work?

6. The department appears to be at an important juncture with regard to retention of senior faculty and in planning for future initiatives. It is hoped that your review can aid this planning and identify aspects of the program that might be at risk. Your insights into what the departmental priorities should be would be appreciated, as well as what the University can do to ensure the well being of the department.

#### Undergraduate programs

1. The undergraduate major in statistics and its place in departmental priorities should be evaluated.
2. The department provides service through several courses to other majors, particularly in the social sciences. Statistics is an important aspect in the training of a social scientist. Should the department consider developing a minor in statistics for social scientists or other majors?
3. The FACET program described in the self-study may be a useful model to apply to raising a statistical awareness in communication majors, specifically those intending to become journalists. You might query the department on the desirability of such an offering, perhaps as a seminar.
4. Statistics is decentralized through the campus with individual units often providing statistical instruction to their own majors. This model is at odds with others, for example, chemistry and physics. Should there be a consistent model? What is the best model for statistics? This question is particularly relevant to the proposed Center for Statistics and the Social Sciences.
5. What is the future of the ACMS program? Is it an experiment that should continue? Are the contributions made by the respective departments appropriate? Does it serve the original intent? If not, can it be more appropriately balanced?

#### Graduate programs

1. The MS and PhD programs appear to have good time to degree, which should be commented upon. Although the department selects entering students for their interest in pursuing the PhD, a relatively large fraction exit the program with an MS. Is this a problem? Do these students go on to successful application of their graduate education? How does retention of students through the PhD compare with other statistics programs?
2. It may be premature to comment on the VIGRE effort, but it appears to be a fine example of the integration of teaching and research that might be cited beyond the campus. An assessment would be appreciated if one can be made.

#### New directions

1. An assessment of the proposed new directions, specifically the plans to develop a Center for Statistics in the Social Sciences and a Computational Finance program would be valuable. Are there well-developed plans? Can the department implement outstanding programs in either or both of these areas?



Please feel free to request additional information from the department or other sources as it is needed for your review. Also, please do not hesitate to call on this office should you need our assistance. The effort you and the other members of the committee are making in undertaking this review is greatly appreciated.

Sincerely,

**John T. Slattery**  
Associate Dean for Academic Programs

c: **Marsha L. Landolt, Dean**  
**Debra Friedman, Associate Provost for Academic Planning**  
**David C. Hodge, Acting Dean, Arts and Sciences**  
**Gary D. Christian, Divisional Dean, Sciences**  
**Frederick L. Campbell, Dean, Undergraduate Education**  
**George S. Bridges, Associate Dean, Undergraduate Education**  
**Review Committee Members**

# **SELF-STUDY DOCUMENT FOR DEPARTMENT REVIEW**

**Department of Statistics**

**10-8-98**

**Addendum 1, 11-4-98**

Unit authorized to offer degrees: **Department of Statistics**  
College: **Arts and Sciences**  
Exact titles of degrees offered: **Bachelor of Science**  
**Master of Science**  
**Doctor of Philosophy**

## **Clarification of Section 7.4.**

In Section 7.4 the report states that “only a small minority of students enroll with the intention of getting a M.S”. This is incorrect. Roughly 25% of the students we admit come with the intention of getting a M.S. So:

- Half the students we graduate finish with a M.S.
- Roughly half of those finishing with a M.S. intended to do so from the beginning. The other half originally intended to get a Ph.D.

On a few occasions, students who came with the intention of getting a Ph.D. left with a M.S. and transferred to other Ph.D. programs at the UW.

## Expansion of Section 7.7

The Graduate School distributes exit questionnaires to MS and Ph.D. graduates. The following tables summarize the results of this survey for 1993 – 1998 (Ph.D.) and 1994 – 1998 (M.S.).

### Ph.D. graduates (n = 34)

	Statistics mean	College mean	University mean
Rating of departmental academic standards	4.38	4.22	4.18
Response to recent developments or trends	4.62	4.37 (p=0.03)	4.25 (p=0.00)
Adequacy of research and professional training	4.23	4.16	3.98 (p=0.05)
Adequacy of space, facilities, and equipment	3.77	3.70	3.52 (p=0.11)
Satisfaction with supervision and/or guidance	4.21	4.00 (p=0.11)	4.09
Confidence in preparation for teaching	3.81	3.60	3.68
Adequacy of teaching preparation for students	4.33	3.97 (p=0.05)	4.06 (p=0.13)
Quality of the faculty	4.29	4.31	4.28
Overall quality of the program	4.26	4.14	4.14

The Department on the average rates as high as or higher than the College and the University in all categories. Note, however, that the standard errors are large. The only significant differences between Department and College are for “Response to recent developments or trends (p=0.03)”, “Satisfaction with supervision and/or guidance” (p=0.11), and “Adequacy of teaching preparation for students” (p=0.05).

### M.S. graduates (n = 25)

	Statistics mean	College mean	University mean
Rating of departmental academic standards	4.44	4.14 (p=0.01)	3.90 (p=0.00)
Response to recent developments or trends	4.60	4.25 (p=0.01)	4.07 (p=0.01)
Adequacy of research and professional training	4.16	4.03	3.71 (p=0.01)
Adequacy of space, facilities, and equipment	4.16	3.79 (p=0.05)	3.35 (p=0.00)
Satisfaction with supervision and/or guidance	3.72	3.77	3.71
Confidence in preparation for teaching	3.56	3.64	3.56
Adequacy of teaching preparation for students	3.60	3.92	3.82
Quality of the faculty	4.56	4.19 (p=0.00)	4.04 (p=0.00)
Overall quality of the program	4.32	4.07 (p=0.05)	3.89 (p=0.00)

The Department rates significantly higher than the College in “Academic standards”, “Response to recent developments or trends”, “Adequacy of space, facilities, and equipment”, “Quality of the faculty”, and “Overall quality of the program”.

UNIVERSITY OF WASHINGTON  
The Graduate School

Department of Statistics Program Review  
November 22, 23, and 24, 1998

AGENDA

**Sunday, November 22**

7:00 p.m. Review Committee Executive Session  
Ponti's Restaurant – 3014 3<sup>rd</sup> North (284-3000)

**Monday, November 23**  
**Room C-301 Padelford**

9:00 - 10:00 a.m. Overview of Issues – Current and Former Chairs  
Michael Perlman, Doug Martin, Galen Shorack,  
Elizabeth Thompson, and Werner Stuetzle

10:00 – 10:15 Break

10:15 - 11:00 Graduate Program  
David Madigan, Graduate Program Coordinator  
Elizabeth Thompson, Graduate Program Coordinator Emeritus  
Jon Wellner (theory sequence), Adrian Raftery (applied sequence)  
Julian Besag (stochastic modeling sequence),  
Thomas Richardson (computing sequence)

11:00 – 11:30 Strategic Directions  
Douglas Martin (Finance UIF), Elizabeth Thompson (Comp Bio),  
Werner Stuetzle (Engineering), Paul Sampson (NRCSE),  
Adrian Raftery, David Madigan, Peter Guttorp

11:30 - 12:00 p.m. Social Science UIF  
David Madigan, Adrian Raftery, Susan Jeffords, Divisional Dean  
for Social Sciences (College of Arts and Sciences), Dick Startz  
(Department of Economics)

12:00 – 1:30 Lunch – Faculty Club, Music Room (West End)  
Review Committee with Tom Fleming (Biostatistics), Bruce Bare  
(Quantitative Ecology and Resource Management),  
Robert Plotnick (Center for Demography and Ecology)

1:30 – 2:00 Michael Perlman (Founding Department Chair)

2:00 – 3:00 Campus Impact  
Elizabeth Thompson (Research), David Madigan (Teaching),  
Paul Sampson (Consulting), Werner Stuetzle, and Peter Guttorp

3:00 – 5:30 Faculty Appointments (20 minutes each)  
Adrian Raftery, Julian Besag, Peter Guttorp, Statistics Junior  
Faculty, and \_\_\_\_\_

5:30 – 6:30 Reception - Faculty Club, Music Room

7:30 p.m. Review Committee Executive Session  
Saleh Al Lago Restaurant  
6804 E. Green Lake Way North (524-4044)

UNIVERSITY OF WASHINGTON  
The Graduate School

Department of Statistics Program Review  
November 22, 23, and 24, 1998

AGENDA

**Tuesday, November 24**  
**Room C-301 Padelford**

- 9:00 - 9:30 a.m. Undergraduate Education – Statistics Service Courses  
Galen Shorack, Undergraduate Adviser, Tilmann Gneiting,  
220 Coordinator, Thomas Richardson, 311 Coordinator,  
Doug Martin, 390 Coordinator, David Madigan, Michael Perlman,  
George Bridges, Associate Dean (Undergraduate Education)
- 9:30 - 10:00 Other Statistics Courses on Campus  
David Madigan, Galen Shorack, Elizabeth Thompson,  
Michael Perlman, (Psychology), Kal Kapur (Industrial Engineering)
- 10:15 - 11:00 ACMS: Galen Shorack and Werner Stuetzle (Statistics  
representatives to ACMS), Randy Leveque (Math/Amath) ACMS  
Director, Jim Burke (Math representative to ACMS), Loyce Adams  
(Amath, VIGRE Co-PI), and Peter Guttorp (ACMS, VIGRE)
- 11:00 – 11:30 Open
- 11:30 - 12:30 p.m. Statistics Graduate Students
- 12:30 – 1:30 Lunch – Review Committee  
(Box lunches to be catered to the conference room)
- 1:00 – 3:00 Review Committee Executive Session.
- 3:00 – 3:15 Wrap-Up: Review Committee with Werner Stuetzle
- 3:15 – 4:00 Exit Interview: Review Committee, Werner Stuetzle, David Hodge,  
Acting Dean, and Gary Christian, Divisional Dean for Sciences  
(College of Arts and Sciences), Marsha Landolt, Dean and Vice  
Provost, and John Slattery, Associate Dean for Academic  
Programs, (The Graduate School), Fred Campbell, Dean  
(Undergraduate Education), and Debra Friedman, Associate  
Provost for Academic Planning (Office of the Provost)
- 4:00 – 5:00 Exit Interview: Review Committee with Deans and Associate  
Provost for Academic Planning
- 5:00 – 5:30 p.m. Review Committee – Final Assignments