

**2010 Regents' Review  
Utah State University  
Department of Mathematics and Statistics  
Committee Report**

## **Executive Summary**

- Overall: The department is functioning remarkably well in spite of the constraints imposed by the current financial difficulties; the atmosphere is positive; mutual respect of the various subgroups for each other is evident.
- Leadership: The leadership of the department is strong and effective
- Academic strengths: A key areas of strength are the traditional core of mathematics; education and statistics are noteworthy as areas of excellence.
- Students: Students are generally satisfied; a Mathematics Club should be started.
- Staff: Staff are competent and satisfied; further reduction in staff should be avoided.
- Facilities: Adequate space for the department should be found.
- Core mathematics: Recovering core mathematics strength in the face of the recent loss of faculty in these areas should be a priority.
- External support: External support from traditional and nontraditional funding sources should be increased.
- Information Technology: Department facilities should be upgraded to a level that is at least equal to those available at regional campuses.

## **Background**

The 2010 Regents' Review Committee for the Department of Mathematics and Statistics was chaired by Peter Olver, Head of School of Mathematics at the University of Minnesota with James Dorward, Associate Dean for Research of the Emma Eccles Jones College of Education and Professor of Education and Utah State University, and George McCabe, Associate Dean for Academic Affairs in the College of Science and Professor of Statistics at Purdue University, as members. The committee met with various groups at Utah State University on March 8 and 9, 2010 to discuss issues related to the department. A copy of the review team itinerary is attached as Appendix A to this report. Prior to these meetings a self review of the department with appendices (A) priorities, goals and strategic planning, (B) general catalog pages including courses, (C) faculty CVs, (D) detailed staff duties and responsibilities, (E) course syllabi, and (F) 2002 final report, was provided to the committee members.

## **General Comments**

Our overall impression of the department was strongly positive, despite numerous challenges, budget constraints, and the recent loss of faculty. The department exhibits many strengths, that we identify below. In almost all of the meetings with faculty and student groups, the comments made to the Committee were preponderantly positive, and included many constructive suggestions for improvement. The department has a first rate faculty, with several achieving national and international prominence for their research contributions. Despite declining resources, the department remains in good shape, and has developed an atmosphere of mutual respect and appreciation for the individuals and component programs. Retention of top faculty in all areas is a serious challenge, particularly given the number that left for other institutions over the last decade. Beyond this, two major concerns emerged during the course of the visit: the attrition in the core mathematics program, putting the overall health of the department in danger; and the proposed relocation of the department to inferior space on campus. Both will be discussed in some detail below.

## **The Department of Mathematics and Statistics at Utah State University**

The department is an innovative and unusual mixture of three principal groups which, in most Universities, would be housed in separate departments, if not different colleges. For reference, these will be labeled Core Mathematics, Statistics, and Mathematics Education. A few faculty have "dual appointments", meaning that their interests impact two of the areas. Most are either mathematicians or statisticians who have developed an interest in education. A few faculty in statistics hold joint appointments in other departments. A smaller group in applied and industrial mathematics also exists, considerably reduced from its former strength. We will comment on the challenges faced by this group below, but for most of our exposition we will consider them to be part of the Core group, where "core" ranges from pure to applied mathematics research.

Despite the potential for conflict and suspicion between these three groups, the Committee found an overwhelming degree of respect and collegiality among the faculty and throughout the department. Each recognizes the importance of all three to fulfilling the department's multiple, interconnected missions and ensuring its quality and health. Overall, the Committee found the morale and atmosphere in the department to be good to excellent.

## **Leadership**

Many people commented on the success and promise of the new administration — meaning the current Head of Department, Richard Cutler, and the new Dean of the College of Science, James MacMahon. Both were viewed as fully committed to the success of the department, and the meeting the challenges of maintaining strength while

rebuilding lagging areas. Both are positively contributing to a new sense of optimism among the faculty.

## **Statistics**

The Statistics Group has evolved into an under-appreciated gem of Utah State University, and one that deserves to be publicized as one of its notable strengths. USU is the only university in Utah, and indeed the Mountain Region, to offer a Ph.D. program in Statistics. Bachelors, Masters and Ph.D. statistics graduates are in high demand, and have no difficulty landing excellent jobs. The Statistics faculty is involved in many research projects and consulting with other university units, particularly in biological applications. While no formal consulting service has been organized, they play an essential role within the university. There has been a consistent increase in enrollments in statistics courses, and upper level courses are oversubscribed. It is worth investigating the institution of a professional masters program.

The faculty currently includes no experts in probability theory, and hiring a suitable person in this area would help bridge statistics and core groups. There was brief discussion as to whether forming a separate Statistics Department would be a good idea. Although strong arguments can be made for such an arrangement, the Committee believes that this is not in the best interests of the university, given the current uncertain budget climate, and therefore, did not consider this issue in detail.

## **Mathematics Education**

The Mathematics Education Program is a great success, and graduates of this program are in high demand by schools throughout Utah. Unlike many Mathematics Education departments, the students at USU are trained in rigorous, high level mathematics, and, as a result, are better prepared for teaching and research, as well as being able to pursue more advanced training in mathematics should they so desire. This accomplishment is the direct result of the Program being housed within the Department of Mathematics and Statistics, and the interactions that the faculty and students in education have with their colleagues in statistics and core mathematics. The department and the university need to further capitalize on the success of the Mathematics Education Program, using it as a means to publicize the strength of the university and its commitment to its Land Grant mission, as well as drawing national and international exposure.

## **Core Mathematics**

Core mathematics (as noted above, including both pure and applied mathematics) is an essential component of any university, and the underlying viability of this group is of concern. Since the last External Review was written in 2002, the core group has suffered the loss of a several of its most recognized researchers. In particular, the strong

differential equations group that was highlighted in the previous report has almost completely disappeared, leaving only three faculty members who work in this area. The group as a whole is demoralized, but not angry, and a revitalization of core mathematics, while maintaining or improving the current strengths in education and statistics, must a priority in the immediate future. Any further loss in the core areas would have a devastating effect on the department and hence the entire university.

As mentioned above, in most universities, the core group would constitute the entire mathematics department. If one compares the number of faculty in core mathematics at USU with the mathematics departments at peer institutions, the disparities and the danger of losing a viable mathematics program is starkly underscored. Our committee recommends the commitment of resources to rebuild core mathematics in the department. Rather than hiring across all disciplines of mathematics, the department should focus on a few signature areas in which to build a critical mass in areas recognized for their excellence. The particular strength of the differential geometry group, with its high international research profile and consistent external funding, and its evident connections to differential equations, analysis, topology, and computer algebra, would be an ideal starting center for this rebuilding effort.

The Applied and Industrial Program is a more difficult issue to resolve and, barring the influx of significant new resources, our committee did not see any good way to revitalize the program at the present time. While the present members should be supported in their research, the scarce resources available at the present time would be better spent rebuilding core mathematics and preserving the strengths of the other two main groups. However, the department cannot completely neglect such a key area of contemporary mathematical research, particularly as it is in high demand by students from science, engineering, and elsewhere. The department should identify targeted opportunities to enhance the program, particularly by building on common research interests with statistics and parts of core mathematics such as differential equations. The Committee notes that several departments (engineering, computer science, etc.) have received new positions in recent years, but the mathematics department has not, despite the increase in teaching loads resulting from increased enrollments in these departments.

## **External Support**

Grant support within the department as a whole is not at a level it could be, and the Committee encourages individuals and groups to submit proposals. Some mechanism to encourage proposal writing should be identified. Equitable overhead distribution and grant accounting in general should be reevaluated.

## **Faculty Issues**

The tenure and promotion processes at Utah State University are unusual among peer institutions, employing a separate committee for each candidate, and not requiring a vote

of the entire department. Similarly, new faculty hires are not voted on by the entire department. Some faculty expressed concerns that, as a result, there is a lack of consistency in the hiring and promotion processes, and a lack of departmental consensus on the future directions, threatening the unity of the faculty. On the other hand, the junior faculty are generally pleased with the promotion process and the support that they receive from the department. There is a strong sabbatical program, and faculty development resources have been directed towards younger faculty. They regard the senior faculty as open to their new ideas. However, they too expressed concerns about the loss of faculty positions. The teaching loads are reaching a breaking point that will hinder recruiting and retaining top level new faculty.

The department has instituted a system of differential teaching loads, where younger faculty have reduced teaching, and faculty that are not active in research volunteer for a larger load. This system works well, and the committee encourages its continuation.

The new placement exams were viewed as extremely beneficial as a means of maintaining consistency in the lower level classes. This year, in response to increasing enrollments and lack of faculty, the department switched a number of lower level courses to large lecture sections. This seems to be working well, although further evaluation on how it impacts the department's educational mission remains to be done, no doubt leading to refinement of this new system of instruction.

In addition to tenure and tenure track faculty, the department employs three lecturers, whose primary responsibility is to teach lower level courses. Their teaching loads are greater than those of the regular faculty. All of the lecturers appeared to be extremely happy with their role in the department. They perceived that their opinions and contributions to the department are valued. In no way did any of them feel like second class citizens in the department. The support for their professional development and attention they receive from the Head should be maintained. The teaching loads of the lecturers are high, and the department should consider adding an additional lecturer to maintain their teaching loads at a reasonable level. There were concerns about the level of technology on campus, which is behind many of the public schools that the students come from. This is an issue that should be examined at the university level.

The mathematics faculty at the Regional Campuses also perceived that their contributions are valued by the department. One of them now serves as assistant to the head and this appointment has sent a clear message about the important role that they play in the mission of the department and the university. After a period of rapid growth, teaching loads have recently decreased, due to the loss of Logan daytime Internet Video Conferencing (IVC) students. Online course instruction designed by and delivered by the regional faculty will continue to expand, as the department increases its commitment to USU's Land Grant mission. While current resources are adequate to meet the demand throughout the State, a small increase in the number of regional faculty would provide this group with the resources they need to develop new initiatives that will benefit the department, the university, and the state. Additional tuition generated by these initiatives would easily offset the resources needed.

## **Staff**

The four staff members in the department are outstanding; their contributions are valued by all who depend on them. While the level of staffing is sufficient to handle current departmental needs, any reduction in force will have catastrophic consequences. Funds for any open positions that might arise must be retained within the department. In recognition of the superior role they are playing, guaranteeing the smooth operation of the department and fulfillment of its many missions, and to ensure their retention, the Committee recommends that merit pay, bonuses, and appropriate promotions be seriously considered. Student help that has been used in the past is not a viable alternative to professional committed staff.

Staff members have started an online filing system. This initiative should be supported and the key people should be recognized for their accomplishments.

Computer services and systems maintenance have declined from their previous levels, with many now being handled by central computing. Campus-wide IT services were deemed to be good, and meeting the needs of the department. The current system is based on seven year old technology, and is in serious need of updating, including a new department server. Access to additional computing resources is needed.

## **Graduate Students**

The graduate students were almost uniformly satisfied with their program and with the department. Several commented favorably on the excellent instruction they are receiving, and the wide selection of courses. They also complemented Cindy Moulton in her role as graduate secretary. The review team noted some disagreements between Masters and Ph.D. students on the level of instructional material of some courses, particularly in statistics. A concern of the students was their preparation for teaching upon arrival at USU. Many of the domestic students said the current Graduate School online teacher preparation course was not very helpful, and some wished they had access to the more extensive training that is given to the foreign TAs.

Concerns about inadequate preparation for the qualifying exams were expressed. Our committee encourages the development of a preparatory course for students who need it. Revisiting the limit on the number of times a student may take the qualifying exams would be worth discussing by the faculty. Students would like to see a better sense of community in the department. The department should seek ways to encourage students (and faculty) to attend colloquia and gain a broader exposure to a wide range of mathematics. The Math Club is no longer functioning and there is poor attendance at colloquia. However, the Math Education Journal Club is very active. While graduate students in Statistics and Education are very strong, some concerns about the quality of students in the core mathematics Ph.D. program were expressed. The department needs to pay attention to this, and rethinking of issues related to recruitment and evaluation is needed.

Graduate topics (7000 level) courses have not been taught for several years, although students can get 7000 level credit by appropriately adapting a 6000 level course. Nevertheless, this is a concern that the lack of such courses negatively affects the quality and depth of the graduate program, and the preparation of students for research careers. Concerns about maintaining a critical mass for the graduate program in core math were expressed. At present, faculty receive no recognition for advising graduate students and a small number mentor most of the Ph.D. students. The committee recommends that the department spread the responsibilities around by recruiting more graduate student advisors, and, to foster this, that some procedure be instituted for rewarding advising, perhaps in the form of teaching releases.

## **Undergraduate Students**

The undergraduate math majors interviewed by the Committee were uniformly happy with the department and their education. A particular strength is the advising, Linda Skabelund, a staff member, does all of the basic advising, while regular faculty concentrate on advising upper level major students. The department has had many outstanding graduates, many of whom have gone on to Ph.D. programs in top tier universities.

An initiative to improve retention rates of undergraduate majors would be beneficial. Possible changes to the undergraduate curriculum include the consolidation of overlapping courses and updating course coverage to reflect new. Some students thought that additional tutoring for advanced level courses would be helpful.

Basic skills in mathematics at an elementary and advanced level are needed for a very large number of the USU undergraduates. The continuing increase in section sizes, and consequent degradation of individual attention and instruction, coupled with increase in faculty work loads, threaten the ability of the department to meet these needs. Given the recent losses to the department, additional resources are needed for the department to fulfill the role expected of it by the university.

While USU has a University Honors Program, there is no mathematics honors program due to lack of manpower to teach honors classes. Thus, while desirable, at present this is not a realistic option. The committee encourages the faculty to devote more resources to undergraduate research projects.

The Mathematics Education students benefit from the Mathematics and Statistics Education Journal Club. However, other math majors do not have a comparable organization. The committee recommends forming a Mathematics Club as a means of bringing math majors together and giving them opportunities to meet with faculty, visitors, and graduate students and to learn more about research opportunities, graduate education, and career choices in mathematics and statistics, both within and outside academia. One of the challenges is to find incentives to increase the enrollments and

visibility of programs, given that increases in tuition revenues do not directly benefit the department.

## **Space**

A grave concern of the faculty and staff in the department is the proposed move to the new agriculture building pending the demolition of Lund Hall. Such a move would severely inhibit the department from adequately fulfilling its functions. The proposed space would not be sufficient to adequately house the present faculty and staff. Any future attempt to bring the department back to some semblance of its former size and strength would be hampered by the lack of space.

One drawback of the current facility in Lund Hall is the lack of a friendly common area, where teas and other gatherings can be held, faculty and students can meet to work on and discuss joint interests, and visitors are able to interact with the members of department. The proposed new facilities would have even less space for such essential purposes that foster a vibrant department community. In summary, our committee deems the proposed move of the department to the new agriculture building as unacceptable.

## **Other Issues**

The 2002 Department Review recommended the appointment of an External Advisory Board to assist the department in the ongoing assessment of its strengths, challenges, and opportunities. This recommendation was not implemented and the present committee reaffirms the recommendation.

Relations with alumni are important. A system for tracking and maintaining contact with them should be implemented.

## **Final Comment**

In summary, the Committee was very favorably impressed with the current situation of the department, despite the serious challenges and problems that they face. We believe that it is important to maintain the quality of this valuable resource and to avoid any further degradation. Our recommendations are designed to accomplish this goal and we hope that the university will seriously consider them.

James Dorward  
George McCabe  
Peter Olver

## **Appendix**

## Department Review Team Daily Itinerary - Monday, March 8

Time	Location	Meet with
8:00 - 9:00 am	Lund rm 311	Breakfast with Senior faculty (full professors): Ian Anderson, (LeRoy Beasley out of town), Larry Cannon, Jim Cangelosi, Dan Coster, Adele Cutler, Mark Fels, Bob Heal, Piotr Kokoszka, Jim Powell, Russell Thompson, Zhi-Qiang Wang, Stan Williams
9:00 - 10:00	ESLC rm 245D	Dean James MacMahon, College of Science
10:00 - 11:00	Lund rm 315	Graduate Committee: Piotr Kokoszka (Chair), Mevin Hooten, Brynja Kohler, Zhi-Qiang Wang
11:00 - 11:30	Lund rm 311	Support Staff: Cindy Moulton, Erika Perkins, Linda Skabelund, Nancy Smart
11:30 - 12:30	Lund rm 311	Lunch with Undergraduate students
12:30 - 1:00 pm		
1:00 - 2:00		Tour Lund Hall with Richard Cutler
2:00 - 3:00	Lund rm 311	Mathematics Education group: Jim Cangelosi, Larry Cannon, Bob Heal, Brynja Kohler, Kady Schneiter, (John Stevens, excused for teaching) (Dave Brown out of town)
3:00 - 4:00	ESLC rm 245D	Video Conference with Regional faculty: Ted Campbell, Camille Fairbourn, Pattie Hayes, Eric Rowley, Piotr Runge, Greg Wheeler
4:00 - 4:30	Lund rm 311	Lecturers: Dave Bregenzer, Claudia Mora Bornholdt, Bryan Borhnoldt
4:30 - 5:00	Lund rm 311	Associate Professors: Chris Corcoran, Joe Koebbe, Juergen Symanzik, Kathryn Turner, Dariusz Wilczynski
5:00 - 6:00	Lund rm 311	Core Mathematics group: Ian Anderson, LeRoy Beasley, Dave Brown, Mark Fels, Nathan Geer, Nghiem Nguyen, Russell Thompson, Zhi-Qiang Wang, Dariusz Wilczynski, Stan Williams
6:30 pm	Richard & Adele Cutler's house 255 Abbey Lane Providence, Utah	Reception with faculty and Staff

## Department Review Team Daily Itinerary - Tuesday, March 9

<b>Time</b>	<b>Location</b>	<b>Meet with</b>
8:00 - 9:00 am	Lund rm 311	Breakfast with Assistant Professors: Dave Brown, Nathan Geer, Mevin Hooten, Peg Howland, (Brynja Kohler excused for teaching), Nghiem Nguyen, Kady Schneider, John Stevens
9:00 - 10:00	Lund rm 315	Statistics Group: Chris Corcoran, Dan Coster, Adele Cutler, Mevin Hooten, Piotr Kokoszka, Kady Schneider, John Stevens, Juergen Symanzik
10:00 - 10:30	Lund rm 311	Undergraduate Committee: Dan Coster (Chair), Bryan Bornholdt, Kady Schneider, John Stevens, Russell Thompson, Dariusz Wilczynski
10:30 - 11:00		Tour Geology building facilities and walk to Old Main with Richard Cutler
11:00 - 12:00	Champ Hall, Old Main	Meet with Provost Coward, Vice Provost Smith, Dean MacMahon, and Dept Head Richard Cutler
12:00 - 1:00 pm	Lund rm 311	Lunch with Graduate students
1:00 - 1:30	Lund rm 315	Applied and Computational Mathematics group: Peg Howland, Joe Koebbe, Brynja Kohler, Jim Powell, Kathryn Turner
1:30 - 2:00	Lund rm 315	Exit meeting with Richard Cutler and Kathryn Turner