

## **Academic Program Review for the University of New Mexico Department of Mathematics and Statistics**

The Academic Program Review Committee conducted a review of the Department of Mathematics and Statistics during the period of April 21-23, 2008. The Review Committee consisted of Sastry Pantula (Statistics) from North Carolina State University, Irene M. Gamba (Applied Mathematics) from University of Texas- Austin, and V. M. (Nitant) Kenkre from University of New Mexico (UNM). Another member of the team, Nicholas Ercolani (Pure Mathematics) of University of Arizona was not able to participate in the review due to medical reasons. The Review Committee met with Dean B. Claiborne, Associate Dean Academic Student Affairs M. Ondrias, Deputy Provost Academic Affairs R. W. Holder, Vice Provost Academic Affairs W. Goering, Acting Dean of Graduate Studies-Associate Dean Academic Affairs School of Engineering C. Fleddermann, Director Research Development and Initiatives D. Wallen, Mathematics and Statistics Department Chair A. Aceves, faculty, graduate and undergraduate students, among others. The Review Committee appreciates all of the comments it received and grateful for the hospitality.

### **Overview:**

Mathematics and Statistics are the languages of sciences and provide the backbone to advancing science. They advance the quality of research done on this campus. Massive data are being collected in financial industry, genome project, climate models, ecology, medical imaging and internet traffic. They are working with computer scientists in machine learning and data mining. Cyberinfrastructure and Discovery are key initiatives at present at NSF. Statisticians are helping with the analysis of brain imaging data on this campus. There are exciting opportunities in biostatistics, bioinformatics, cheminformatics. NIH is investing heavily in translational research centers, and statisticians and applied mathematicians are at the center of such centers.

This department is doing an excellent job in research- brought in over \$6 million dollars in grant support last year. Some faculty members have outstanding research funding, and junior faculty show excellent potential for funding in the future. Faculty members in the department are publishing in various subjects and interdisciplinary journals. There are strong ties on this campus between this department and other very successful departments on campus; these include Anthropology, Biology, Computer Science, Physics and Astronomy and Medical Sciences. One of the strengths of the Department is its intense involvement with two excellent centers and one program on the campus:

- The Cancer Center in Health Sciences
- Consortium of Americas for Interdisciplinary Science
- PIBBS- an interdisciplinary program funded by Howard Hughes Medical Institute

It is an exciting time to be a Mathematician or a Statistician! However, at UNM, due to lack of resources and revolving doors at administrative levels, faculty are performing

more like – *Mathmagicians*. In the clear opinion of this review team, the situation here is in an emergency state and immediate action is critical. The emergency is clear from an exodus of statisticians who have left the department recently and another group of applied mathematicians who have their foot out the door this year.

In 1996-97- the department had 35 tenured/tenure track faculty and 3 lecturers.

In 2006-07- the department had 26.5 tenured/tenure track faculty and 8 lecturers.

During this period, they almost doubled the number of credit hours they teach and doubled the research funding in the department, and saw a significant growth in their graduate program. Higher dependence on lecturers who are hired on a semester by semester basis with funding uncertainty is affecting morale and quality of instruction may be suffering. It is the committee’s understanding that the salaries in the department are not nationally competitive (data provided to the administration), and retention offers in the recent past have not been adequate.

Any future hiring plan should take into account the recent losses in applied mathematics and statistics areas, and the current distributions:

Currently, there are:

<u>Area</u>	<u>Graduate Students</u>	<u>Faculty</u>
Pure Math	30	10
Applied Math	46	9.5 (will become 6.5 in fall)
Statistics	46	5.3 (3 are asst prof)

It is important to develop the hiring plan that is consistent with national needs in these three areas, with the vision provided by the earlier memos to the Dean from various groups within the department. If it were left entirely to the department, it would be natural for the groups to protect their own turf than think about the common good. As one faculty member put it, “Why would I want to suggest hiring more statisticians now when I think that they may become a separate department in the future?”

Graduate students said in their conversations to this committee that they are leaving because they cannot find an advisor to work with or appropriate courses to take. They have to change advisors because of the recent faculty departures. It was depressing to listen to hear their frustrations. At the same time it was also refreshing to hear from one student: “It is amazing how our faculty are doing miracles with limited resources they have. They are very good teachers and mentors.” But, in a later more private conversation with the committee, she also mentioned that “it discourages me for considering academia as my future. I want to have a decent life.”

There are 22 sections of courses in applied mathematics (that are 300 level or above) scheduled each semester. In Fall 08, they need to be covered by 6.5 faculty. That is a 3.4 course load per semester by research productive faculty. The course load at other AAU universities is 3 courses per year, not per semester!

An alternative that was suggested was to hire more part-time instructors. The Dean of the Graduate Studies indicated that, “if this is the case, some engineering departments may choose to teach their own mathematics and statistics courses.” It is neither appropriate nor efficient for example each department teaching their own general education courses, or for all these courses to be covered by part-time instructors.

Based on the comments from faculty and students, it is clear that not enough graduate courses are offered each semester in mathematics and statistics. For example, graduate students do not have a third course to take each semester, and end up signing up for independent study with faculty. That means, faculty members in effect are teaching three courses per semester, but are getting credit for only two. This is especially burdensome to junior faculty who are working hard to build their research career.

### **Some specific recommendations by this review team:**

1. Create some visiting professor lines, and bring some senior visitors immediately to help with teaching and research during the academic year 08-09.
2. Repair the dangerous situation with faculty losses in Applied Mathematics in Statistics by doing the following. Hire 2 senior and 3 junior faculty members in statistics over the next 3 years. Hire at a similar level in the Applied Mathematics program, to build on its existing strengths. In either of these cases choose the new appointments to benefit the interdisciplinary areas on campus, especially with the three research centers/program mentioned above, and with departments such as Anthropology, Biology and Computer Science. Notice, that the suggestions here are for replacing all of the lost positions, not requests for additional positions.
3. Encourage joint appointments to foster multidisciplinary research.
4. Encourage the Math Education initiatives in the department. The review committee strongly supports them. They are consistent with the goals of the College Dean and the University President. They are low cost, high return, and long term pay off initiatives.
5. Postpone the discussion of separating Mathematics and Statistics till the above hiring plan is implemented and Statistics has at least 10 faculty members. Decisions about hiring, investing in Statistics, and the space in the new building be not postponed because of the possible split up in the future. Space considerations in the new building should be based more on programmatic issues (e.g., the synergy that comes from interactions with the neighbors) than on a simple convenience or concerns of short-changing a current minority.
6. Faculty with an active research grants must be given a reduced (2+1) course load in order for them to continue to be successful in their research and grant funding. Also, it will give an opportunity to explore collaborative research with the research centers and other successful departments.

7. Encourage to apply for NSF SCREMS grants and use student fees or other sources to invest in upgrading computers for students. This is based on our finding that computing facilities and resources for graduate students are outdated and inadequate.
8. Set up a common departmental tutorial room for the TAs to meet their students.
9. All of the 100 level service teaching (a bulk of the credit hours generated by the department) is done by the part-time instructors, who are hired one semester at a time. Allocate permanent budget lines to the department to manage the PTI hiring and to efficiently manage the budget.
10. Department can be given the flexibility to use the lapsed salary from course buyouts, sabbatical leaves and vacant positions to bring visitors and cover the upper level courses.

### **Responses to some specific questions:**

1. How do we enhance our undergraduate and graduate programs?

We agree that the tasks of delivering and overseeing service classes shift the focus away from the undergraduate and graduate programs within the department.

The size of the undergraduate program is reasonable. The course work that is in the catalog covers a good foundation of courses. There is only a limited opportunity to take special topics courses in their junior and senior years. Faculty may not have enough time to devote to all of their advisees. A couple of undergraduates we met are very positive about their experience and considering a double major and pursue a graduate program in the future. The most recently awarded NSF\_MCTP grant will help transition undergraduates to graduate degrees, through appropriate mentoring at some critical transition points. The department should be congratulated for taking the time to invest in mentoring and for their success in getting the grant award. There are opportunities to enhance the training in computational methods (NSF-CSUMS) and undergraduate training in mathematical sciences and biological sciences (NSF-UBM). We were not given the data on the quality of undergraduate students or on what percentage of them currently continue on for graduate schools.

The size of the graduate program is too large for the number of research active faculty in the department. There are 30 graduate students in Pure Math program, with 10 faculty to advise them. There are 46 graduate students in Applied Math program with 9.5 faculty to advise them. Of these 9.5 faculty members, three of them are scheduled to leave by Fall 08. In the Statistics program, there are 46 graduate students advised by 5.3 faculty. Given the scheduled departures in applied math faculty and the exodus of statistics senior faculty during the past few years, the problem of advising

doctoral students is acute in both applied math and statistics. Given the national need for broadly trained mathematical scientists, we recommend that significant investments be made in hiring more faculty (at the least replace the recent losses) in these two areas as soon as possible. It may be advisable to put a moratorium on graduate recruiting until the faculty shortage issue is addressed significantly. It is not fair to burden the assistant professors in these areas to direct graduate students during their fledgling years. They need to focus on their own research, develop interactions with other scientists, and submit grant proposals. The programs can grow as the national need for them grows and the resources to support for them grow. If there are not resources to hire faculty, then the quality of the graduate program will deteriorate.

The TA stipends are not comparable to those for their peers. For example, at NC State, the rate for TAs is \$1,875 per month and the health insurance and in-state tuition are covered. Any effort to bring them up will enhance the chances to recruit high quality students. There is some feeling among students and faculty that students are kept longer in this department as TAs to meet the need to cover the courses. Appropriate resources can solve these issues and enhance the quality of students.

The Review Team did not address the curriculum requirements for doctoral degrees in three specialty areas. It acknowledges that doctoral students in Pure Mathematics are more likely to go into academia and hence it is appropriate for them to teach as much as possible.

2. How can we grow in Mathematics Education without doing it at the expense of the other sub-disciplines?

The committee is excited about the white paper submitted on Math Education initiatives. The goals of this initiative are consistent with those of the college, university and the state of New Mexico. It is a low cost investment with a high potential. Collaborations with education department and high school system are encouraged. Funding from NSF and private donors may eliminate some competition for resources with other sub-disciplines. The recent "Mentoring through critical transition points" (MCTP) is a feather in the department's cap, especially for those in the applied mathematics program. Similar grants may be applied for the math education initiatives.

3. Should we consider splitting into two departments one of Mathematics and one of Statistics?

This is not the appropriate time for such a split given the current demographics in the department. Once Statistics has a critical mass, say at least 10 faculty, this issue may be visited in the future. Any decision for a split should be based on needs of Statistics group to flourish independently and scientifically, rather than on space considerations.

4. What should we do to increase our research productivity, in way that benefits students, the university and the academic community?

The department should be congratulated for its successes in funding in spite of heavy teaching loads and lack of adequate administrative support in the Contracts and Grants office. It is our understanding that there is a new Vice President for Research and that things are improving in terms of processing the grant paperwork properly and efficiently. The better such service on campus is, the higher the success rate in getting funding for research. There is a lack of senior leadership to mentor junior faculty as it relates to grant funding. Inviting the program officers from various granting agencies will be one positive step. Sending the junior faculty to attend “New Researchers Conference” will pay off in the long run. Collaborative grants between junior and senior faculty, and across the departments should be strongly encouraged and arranged. Senior faculty from other departments, and successful centers could provide opportunities for collaborative research, especially in the areas of applied mathematics and statistics. Also, there are opportunities to work with nearby national labs for securing research funding and to develop collaborative research. Nationally, there is a move towards multi-disciplinary research, and UNM has several outstanding departments where mathematics and statistics can play an important partnership role.

5. How should we develop a long term hiring plan with a strategy for faculty retention?

This issue was discussed above in detail. It is important to pay attention to the market in terms of salaries for pure mathematicians, applied mathematicians and statisticians. Clearly, there are differences in salaries nationally among these three sub-disciplines. Faculty seemed to be comfortable with having such differences in salaries within the department. Administration needs to be aware of such differences and react proactively and preemptively. The loss of several excellent faculty to other departments during the last five years is not easy to recover. The review team felt very optimistic that the new Dean has an excellent vision and recognizes the quality among her faculty. It is important to develop a five year plan (similar to what has been suggested above) that is consistent with the university goals, resources, and national needs. Certainly, this department could become a shining diamond under the new leadership. Appropriate investment in vibrant sub-fields can have a long-term pay off. The Department has done extremely well in recruiting some bright young faculty in the recent years. It is now up to the leadership to nurture and mentor them to be successful stars, while hiring additional faculty to share the research, teaching and collaborations across the campus.

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