

Department of Mathematical Sciences



To: Pamela Jansma, Dean, Arts and Sciences
From: Patrick Morandi, Academic Department Head
Date: 18 December 2008
Subject: Summary of the department's activities for 2008

The members of the Department of Mathematical Sciences worked extremely hard in 2008 and were productive in many ways. I will outline some of its primary achievements for the year.

Grants and Awards

David Pengelley will be the recipient of the Mathematical Association of America's Deborah and Franklin Tepper Haimo Award for distinguished college or university teaching of mathematics. He will receive the award at the joint mathematics meeting in January 2009. Four faculty members, Pat Baggett, Christina Mariani, Pat Morandi, and Bruce Olberding received the Arts and Sciences Faculty Outstanding Achievement Awards. Mary Ballyk was nominated for the Donald C. Roush Award for Teaching Excellence, to be given in January 2009.

The department does a great deal of work with public school teachers. Mary Ballyk, Larry Hughes, Doug Kurtz, Pat Morandi, Bruce Olberding, Ted Stanford, Tony Wang, and Linda Zimmerman, along with several members of the College of Education, through the large, collaborative state-funded grant, Mathematically Connected Communities (MCC), lead a nationally recognized, statewide effort to improve middle school mathematics education in New Mexico. Mathematics faculty work with educators to design and conduct intensive summer academies for middle and high school teachers, and we continue to work with these teachers closely throughout the year. This project has been funded by the New Mexico Public Education Department, and has funding through 2010. It has thus far over \$5,500,000 in funding. In addition, members of the College of Education received funding last year to perform a research study on the effectiveness of the MCC project.

Susana Salamanca-Riba is the PI for a Mathematical Sciences Partnership award from the Institute for Advanced Study/Park City Mathematics Institute to help Las Cruces and Gadsden middle and high school teachers improve their mathematical knowledge and study the effect of their teaching practices on student learning. The program also provides funds for teachers to attend a three-week summer workshop in Park City. The project was funded for \$200,000 in 2006, and received additional funding of \$111,000 in 2008.

Guram Bezhanishvili, Jerry Lodder, and David Pengelley are collaborating with faculty from Computer Science on a National Science Foundation (NSF) funded grant to implement student projects for active learning from primary historical sources in several undergraduate courses for majors in Mathematics, Computer Science, and Secondary Mathematics Education. The department is a national leader in the use of historical sources in teaching mathematics. These projects provide increased motivation and enhance the ability of students with diverse learning styles to succeed. The group had previously received NSF funding, and in 2007 received a \$434,000 grant to continue their work.

Late in 2006, the department received \$600,000 in funding for Project MESH (Mathematics, Engineering, Science Hybrids). David Finston is the project manager and Caroline Sweezy is one of the key personnel on the project. This three year project will improve recruitment and retention of minority students by developing introductory web-based courses which combine mathematics and science aimed at students who have completed mathematics through high school Algebra II. It will also increase retention and success in engineering calculus courses through the development of a required 1 credit recitation section for Math 191 and Math 192 which will reinforce the connections between mathematics and science and engineering applications. This summer the grant funded three workshops for high school students, connecting mathematics with biology, chemistry, and engineering.

A few faculty members continued to receive external funding to support their research, which has become extremely difficult to obtain. Jens Funke and Tiziana Giorgi were supported with funding from the NSF. Joe Lakey and Hung Nguyen were partially supported by the Los Alamos National Labs.

In March Pat Morandi and Doug Kurtz co-wrote an NSF proposal with members of the College of Education to further work of MCC and to fund creation of courses for an innovative Master's of Arts in Teaching Mathematics Program. Bruce Olberding and Ted Stanford were involved in that component of the proposal. The \$10,000,000 grant proposal was ultimately not funded, but members of the group plan to rewrite the proposal and resubmit it to NSF.

Personnel Developments

The major personnel development of the year was the retirement or resignation of several faculty. Kathryn Engebos retired, and Roger Beck resigned to work full-time on a grant in the College of Agriculture. Five faculty, Jens Funke, Mai Gehrke, Elizabeth Gasparim, Martin Krupa, and Adam Sikora, resigned, each for personal reasons. The department thus has the fewest tenure-track faculty in the past 30 years. We have permission to fill four tenure-track positions, have advertised, and have a pool of candidates, from which we expect to interview at the start of the spring semester. While we had hoped to fill Kathryn's position for Spring 2009, it has been frozen by the central administration.

A few faculty members were promoted or tenured this past year. Christina Mariani was promoted to Professor and Mary Ballyk and Jens Funke were promoted to Associate Professor and given tenure. Bruce Olberding is currently being considered for promotion to Professor.

There were several faculty members on leave in 2008. Guram Bezhanishvili was on sabbatical leave in the 2007-2008 academic year, and Tiziana Giorgi, Hung Nguyen, Robert Smits were on sabbatical leave in the fall. Sue Schibel is on long term disability for the 2008-2009 academic year. We hired César Luis García as visiting professor for the academic year due to the large number of faculty on leave.

In Fall 2006 the Provost approved a position in Mathematics Education to be shared between the department and the Department of Curriculum and Instruction. We were unsuccessful in filling the position last year, and have re-advertised the position. As of December, 2008 we have a pool of candidates, and plan to interview at the beginning of the spring semester.

Research and Creative Activities

Members of the department were very productive researchers in 2008. The tenure track faculty had a total of 41 papers published, 30 papers accepted, and 22 papers submitted. In addition, two textbooks written by faculty members was published several. Faculty members gave about 60 talks at conferences or other universities. The number of invitations to speak indicates the national and international reputation of the faculty.

Our faculty is well represented as journal editors. Lolina Alvarez, Guram Bezhanishvili, John Harding, Christina Mariani, Hung Nguyen, and Ross Staffeldt are all editors of research journals. In addition, several faculty members are involved in organizing research conferences. Guram Bezhanishvili was a member of the program or steering committee for Advances in Modal Logic 2008 in Nancy France, the Fourth International Tbilisi Summer School in Logic and Language, Tbilisi Georgia, the Student Session of the European Summer School in Logic, Language, and Computation, in Hamburg Germany, and the International Workshop on Topological Methods in Logic in Tbilisi, Georgia. Bruce Olberding was on the scientific committee of the Fifth International Fez Conference on Commutative Algebra and Applications, in Fez, Morocco. Susana Salamanca-Riba is co-organizing two conferences in 2009.

The department sponsors a weekly colloquium and several weekly seminars. The colloquium series had 26 lectures. Most of the speakers from other institutions visit the department to collaborate with our faculty on their research. Speakers from NMSU came from the Departments of Astronomy and Electrical Engineering, along with one from our own department. The department runs seminars in algebra, analysis, applied mathematics, lattice theory, statistics, and topology. Two students have organized a seminar given by and for graduate students. Most faculty and many graduate students attend at least one of the seminars.

There are several faculty who do research on interdisciplinary projects. Ernie Barany and Mary Ballyk are working with a group in the Biology department to develop undergraduate research opportunities and a program of study at the interface of the mathematical and life sciences. Hung Nguyen, worked with Jack Wright of the Geography Department on a LANL-funded project. Joe Lakey is working with faculty in the Electrical and Computer Engineering Department on his DARPA grant through LANL. Christina Mariani collaborates with faculty in Computer Science, Finance, Industrial Engineering, and Physics, on a variety of problems. Finally, a large group of faculty are working with the College of Education on several projects involving both teacher training and education of elementary school students.

Curricular Activities

By introducing recitation sections in calculus and large lecture format sections of mathematics appreciation, the department increased its student credit hour production from 2005-2006 to 2006-2007 and from 2006-2007 to 2007-2008, resulting in it being reclassified as a "green" department. In addition, we have increased the number of students in our undergraduate and graduate programs, and we currently have approximately 60 graduate students. We are ready to implement the Professional Master's Degree in Financial Mathematics, once the program is approved by the State Board of Finance. We have also introduced emphases in our major, and besides the general emphasis, which is our standard degree, we have emphases in applied mathematics and actuarial science and insurance. We expect to attract more students to the major through making our program more flexible, allowing students to obtain a program of study better connected to their interests.

The department has put a great deal of effort into revamping the precalculus courses, Math 115, 180, 185, converting them into the sequence Math 120, 121, 190, intermediate algebra, college algebra, and pre-calculus. Work on revising these courses began several years ago, and in Fall 2006, we taught Math 120, 121, and 190 each for the first time. The courses are running moderately smoothly. However, we are continuing to make changes in the courses to serve students as best we can.

The department, through the hard work of Maria Christina Mariani, aided by Lolina Alvarez, has developed a professional Master's degree program in financial mathematics. This program is a collaboration between us and the Department of Finance. It is aimed at attracting a new group of students to our department. The students in this program will need a background in calculus, linear algebra, statistics, and probability. They will take 10 courses, 3 finance courses, and 7 mathematics and statistics courses. Of these, 5 are long existing courses in our department, and 2 are courses in Financial Mathematics, Math 521 and Math 522, created by Maria Christina Mariani, which have been taught already with good sized audiences. The program has been approved by all necessary NMSU organizations, and the final step to approval is for the State Board of Finance to approve it. Approval for the program may come shortly.

In Fall 2008 the department had 77 mathematics majors. We cannot determine the number of supplementary majors through banner or cognos, but the program is quite popular, and we have a considerable number of supplementary majors, especially among engineering students. Our undergraduate program is overseen by the department's Majors and Minors Committee, headed by Lolina Alvarez. The department supports a chapter of the national mathematics honor society, Pi Mu Epsilon. Bruce Olberding and Mary Ballyk have been working to find ways to increase student interest in mathematics by putting on "mathematics happy hours", which have proved to be popular. We have obtained private funding from Harris Corporation in the past two years to sponsor a Mathematics Modeling team to compete in the two COMAP competitions. Caroline Sweezy organizes the various student competitions.

Enrollment in our graduate program reached 60 students. Thanks in part to efforts by David Finston, we are one of only two universities in the nation to obtain a commitment from the Sloan Foundation to fund fellowships for minority mathematics graduate students. Currently we have 2 graduate students who have received this highly prestigious \$30,000 Sloan Foundation award. In addition, we have one student supported through the Bridge to the Doctorate Fellowship. Two of our students are supported by National Physical Science Consortium fellowships. The graduate program is overseen by the department's Graduate Committee, chaired by Christina Mariani. The duties of the committee include making recommendations on admissions and the granting of graduate assistantships, organizing the comprehensive examinations, and advising.

Student advising is organized by three departmental committees. Undergraduate mathematics majors, minors, and supplementary majors are advised primarily by members of the Majors and Minors Committee. The committee also nominates mathematics majors for scholarships and awards, and informs them about study and career opportunities. Graduate students in the department are initially advised by members of the Graduate Committee before they choose an advisor related to their research interests. Finally, members of the department advise unclassified students through the Arts and Sciences Advising Center.

Service and Outreach Activities

The department provides service to the university, the state, and the mathematical community in several ways. Lolina Alvarez served on the Faculty Affairs Committee. Pat Baggett is a member of the Curriculum and Educational Policies Committee. Christina Mariani is a member of the Graduate Council and the Improvement of Instruction and Student Relations Committee. John Harding served on the College Curriculum and Education Policies Committee. Joe Lakey is the chair of the University Appeals Board and a member of the Faculty Senate. Pat Morandi is a member of the Planning and Budget Committee. Tony Wang served on the Research Affairs Committee. Committee. Pat Baggett, John Harding, Doug Kurtz, and Hung Nguyen each served as an outside member of the Tenure and Promotion Committee for an Arts and Sciences department.

Faculty members contribute to the profession in many ways. Most referee papers and/or review for *Mathematical Reviews* or *Zentralblatt*, the two main reviewing sources for mathematical articles. Ted Stanford serves on The New Mexico Mathematics and Science Advisory Council and the Mathematics Planning Committee of the New Mexico Public Education Department. Robert Smits was the department's liaison to the Mathematical Association of America and the representative to the Rocky Mountain Mathematics Consortium. Lolina Alvarez Christina Mariani, and Erica Voges were judges for various contests.

The department puts a great deal of effort into outreach. Pat Baggett is a member of the Science Education Alliance, which has a program of student outreach in schools for mathematics, similar to one created earlier for science. The program has undergraduates volunteer to help in mathematics classes in the Las Cruces public schools. This will give teachers additional help in their classrooms and give students experience in working with children on mathematics. Several faculty members work with students in local schools. Dave Finston's Math 210G students produced radio scrips for a series, "Critical Math", which was produced by and broadcast on KRWG in the spring. Several faculty served as judges for various contests. Susana Salamanca-Riba works with a group of teachers from Gadsden, Oñate, and LC High School on the program *Lesson Study*. Teachers get together to design a lesson which will help them reflect on their classroom practices, focussing on student thinking and understanding of the mathematics. They observe one of the teachers teach the lesson, then get together to revise the lesson. They then observe another teacher teach it, and then revise it and write it up as a resource for other teachers. Pat Morandi, Dave Finston, and Ted Stanford were each invited to speak in the local Science Cafe, a science lecture series hosted by the Las Cruces Museum of Natural History. Ted Stanford works regularly with middle school teachers, and conducts enrichment workshops, as part of his work on the Mathematically Connected Communities (MCC) project. He is also serving on the New Mexico Mathematics and Science Advisory Council to work with the New Mexico Public Education Department to implement recommendations which came out of a town hall meeting in November 2005. A total of eight faculty and one graduate student from the department work on the MCC project.