

# Department of Mathematical Sciences Annual Report for 2003

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## 1. Overview

In August, 2003, Dr. Ross Staffeldt became department head, succeeding Dr. David Finston, who had served since 1999. In 2002 and in 2003 a total of six new faculty joined the department. In 2003 the three who joined are Dr. Mary Ballyk, who specializes in dynamical systems related to mathematical biology, Dr. Jens Funke, who specializes in number theory and representation theory, and Dr. Maria Cristina Mariani, who specializes in partial differential equations and applications to mathematical physics and finance. The level of energy and activity around the department has risen, reflecting the enthusiasm of the new hires and their warm welcome by senior faculty. The department thanks the NMSU ADVANCE program for its aid in putting together startup packages for new faculty, and for support for recently arrived faculty.

A new AGEP fellow joined the ranks of the graduate students in fall 2003, bringing our total number of AGEP fellows to three. We thank the NM AGEP program office at NMSU for support of our efforts to recruit additional graduate students and for their contributions to student support over the years. Thanks are also due to members of the NMSU Mathematics Association, whose contributions to the NMSU Foundation provided additional support to our recruiting efforts and special enrichment activities for students already here.

Twenty one faculty reported 49 refereed publications appearing in 2003. Many more faculty were active presenters at conferences world wide. Twenty five faculty were also associated with over fifty grants and proposals for support in 2003.

The number of students declaring themselves to be math majors or candidates for the supplementary major in applied mathematics has reached a new high. Many members of the department are participating in elements of curriculum review and development. Improving the content knowledge of teachers is another main interest of faculty in the department.

Members of the faculty provide quality service to the profession, through editing, refereeing, and reviewing, as well as in administrative activities of the professional organizations. Faculty are also involved in on-campus service activities and in service to the local community.

More highlights of these points are provided below.

## 2. Personnel Developments

In spring 2003 Dr. Peter van Rossum of the University of Nijmegen was a visitor to the department. Dr. Joseph Lakey was on sabbatical leave in Spring 2003, spending most of his time at the University of Texas in Austin; Dr. David Pengelley was on leave without pay in spring 2003, continuing a sabbatical leave that started in fall 2002; Dr. Irena Swanson was on sabbatical leave in Spring 2003, spending most of her time at the Mathematical Sciences Research Institute (MSRI) in Berkeley, California. All three have returned to New Mexico State University. Dr. Nhu Nguen remains on leave without pay, which began in the academic year 2002-03; he is expected to return for fall 2004. This fall Dr. John Harding is on sabbatical leave, traveling extensively. He will return to teaching in spring 2004. Dr. Josefina Alvarez and Dr. Patrick Morandi are also on sabbatical leave and traveling extensively, but they are not scheduled to return until fall 2004. The ADVANCE program has provided course releases to Dr. Mary Ballyk for fall 2003 and Dr. Elizabeth Gasparim for both spring and fall 2003.

New tenure track faculty are Dr. Mary Ballyk, Dr. Maria Cristina Mariani, and Dr. Jens Funke. There are no new college track faculty appointments for 2003. In 2003 there were no retirements.

Mr. Min Li became the second full time employee of the department's Computer Operations Group.

Ms. Susan Schibel was promoted from College Instructor to College Assistant Professor in spring 2003. This fall the department has put up Ms. Suzanne Hill for promotion from College Instructor to College Assistant Professor, Ms. Alyne Fulte for promotion from College Assistant Professor to College Associate Professor, and Ms. Barbara Sallach for promotion from College Associate Professor to College Professor. Among tenure track faculty, Dr. Bruce Olberding and Dr. Theodore Stanford are both up for tenure and for promotion from Assistant Professor to Associate Professor, and Dr. Jerry Lodder is a candidate for promotion from Associate Professor to Professor.

## 3. Curricular Activities

Professor Baggett continues to develop courses for present and future elementary and middle school teachers in the partnership format. A collaborative effort between the department and the Computer Science department has resulted in a new course on discrete structures that will serve as an alternative mathematics

requirement for the CS degree, replacing two courses required previously. The initial runs of the course have not proved to be satisfactory, and a lot of effort is being invested to fix the problems. This adjustment to the CS curriculum will require us to adjust Math 377 and Math 430, one of which is currently required of a CS major; these discussions will be handled by the Liaison Committee. Another collaborative effort between our departments resulted in a successful grant proposal to the National Science Foundation to support the development of curricular materials based on historical sources for our discrete mathematics program. The Undergraduate Curriculum Committee is developing a proposal to alter our scientific calculus program from three 3 credit courses to three 4 credit courses. The Liaison Committee is working together with the Undergraduate Curriculum Committee to collect feedback from client departments in the College of Engineering to guide the development. The Liaison Committee will also be discussing the needs of the College of Business Administration and Economics about their needs and plans for Math 142 and Math 185.

One of the department's major curricular efforts has involved development of course materials using mathematical software and the internet to improve courses taken by mathematics, science, engineering, and education majors. With NASA support, Professor Staffeldt developed materials that incorporate advanced software in our course in third semester calculus. The software enables students to investigate fine details of surfaces in three dimensional space and also to apply calculus to more realistic problems. These innovations have made their way now into nearly all sections of that course and into our undergraduate course in ordinary differential equations. Dr. Mary Ballyk and our Ph.D. candidate Mr. Hubert Noussi are working to transfer some of the material for the differential equations course from the Maple platform to the Matlab platform. When this work is completed, students will be able to compare results of the two software packages and they will have a choice of tools for their course. The choice of platforms should make it easier for non-math majors to transfer what they learn in our course to courses in their own departments.

How to improve our introductory courses in modern algebra and analysis is being discussed by a few faculty. Professor Morandi had NASA support to redesign our introductory course in modern algebra, Math 331, required of math and secondary math education majors. The redesign introduces abstract concepts through familiar applications and uses software to effect calculations structures that generalize our familiar number systems. Dr. Kurtz is working on a text to better address the needs of our students in the introductory course in analysis,

Math 332.

Coincidentally, the Committee on the Undergraduate Program in Mathematics of the Mathematical Association of America has published its latest curriculum guide, which contains much potentially useful material, such as model self-study questionnaires, clearly stated suggestions for program goals, statistical reports on the undergraduate student body, and lists of resources to help with course design and revision.

Faculty are using technology for teaching purposes in many ways. In addition to using the internet for posting class materials and communicating with students, computer demonstrations have become integral to teaching at all levels. The old portable PC/overhead projector combination has proved to be unwieldy for effective classroom demonstrations. We have equipped some of our classrooms with permanently installed overhead projectors and have acquired sufficiently many laptop computers to enable many more faculty members to integrate computer use in their teaching. Future planning calls for the purchase of portable projectors because of concerns for the security of the ceiling mounted projectors. Funding for this process is provided by Instructional Equipment funds and grants from NASA and the Department of Education.

The department participates actively in the Honors and General Education programs. Faculty members routinely teach the Honors courses “Spirit and Evolution of Mathematics” and “Great Theorems: The Art of Mathematics.” Honors courses on mathematics appreciation and number theory have been developed. In addition to the Honors courses, the department offers an array of courses approved for General Education, including courses on mathematics for elementary education, business calculus, and mathematics appreciation. An alternate means of meeting the General Education requirement in mathematics is to take six credits of mathematics that require Math 115.

### **3.1. Teaching Improvement**

The Teaching Committee oversees the coordination of multi-section courses and classroom observations of faculty members and graduate student teaching assistants. In 2002 the committee drafted plans for a longitudinal study of student performance, to assess the efficacy of current mathematics preparation for courses with mathematics prerequisites. We were unsuccessful in obtaining funds for release time for Professor Lampert to collect and analyze the appropriate data.

On the other hand, the department did complete a study of Math 115. In

spring 2003 doctoral student Elaine Cohen undertook a study of the course and comparable courses at our sixteen peer institutions. The intent is to use the study to make recommendations for changes in our Math 115 to better serve our students, basing the changes on successful strategies used among our peer institutions. The study examined admission requirements, mathematical profile of newly admitted students, places of the courses in academic programs, placement strategies, pedagogical methods, support structures and measurements of success and rates of success. One of the first things revealed by the study is that only eight of the sixteen peer institutions offer a comparable course. Summarizing very briefly the admission requirements and mathematical profile of admitted freshmen, the study indicates that the average ACT scores of entering NMSU freshman are lower than the scores at all other peer institutions. Concerning course content, Math 115 is more comprehensive than the “Intermediate Algebra” courses at the peer institutions, and only one other institution has a specially designed and staffed tutoring center similar to the Math Learning Center. Pass rates at NMSU are below those of some of our peers, but when one factors in our greater course content, weaker backgrounds of students, testing of different modes of reasoning, and objective grading standards, the success rate of our students is comparable to, or better than, those of our peers. Two main recommendations to improve our Math 115 are to increase the use of computers and educational software, which we believe are good tools for increasing student proficiency on certain types of problems, and to continue to emphasize the need for schools to aim for improving the mathematical training of high school students. Increasing the use of computers and educational software will require greater investment in hardware, software, and in qualified staff to maintain the installation and other staff to actually handle the teaching.

Faculty members participate in the Gaining Retention and Achievement for Students Program (GRASP), which is coordinate by Dr. Judy McShannon of the NMSU Space Grant Consortium. So far, Dr. Staffeldt, Dr. Bezhanishvili, Dr. Gasparim, and Dr. Salamanca-Riba have participated in the program, which aims to make faculty aware of various student learning styles and to provide suggestions and guidance while faculty attempt and practice alternative teaching strategies. More faculty would have participated in spring 2003, but GRASP was overextended.

Faculty members are using advanced technology, including mathematical software and the internet, in significant ways in their teaching. With NASA, NSF, and Department of Education support, Professor Baggett is offering a new course

on the use of technology in elementary science classes. Professor Staffeldt has developed programs used by several faculty to aid students in visualization of various structures of geometric significance in calculus and differential equations courses. He published a paper about this work and spoke about it at national conferences on engineering education. Professor Morandi has developed programs for use in graduate modern algebra courses and uses internet sites in courses for prospective teachers. The same NASA funding provided him with a course release to revamp the introductory course in modern algebra required of mathematical sciences and secondary mathematics education majors.

A major strength of the department's educational program is the participation of graduate students and talented undergraduates as tutors and graders in the Mathematics Learning Center. This provides a history of experience with the peer-tutoring aspect of learning, which is inherent in the cooperative learning projects now taking place in many other classes. It creates a valuable training program for new graduate assistants, introducing them to educational issues while they are under close supervision by experienced educators. The Math Learning Center also administers the Deborah Louise Thomas award for outstanding undergraduate tutors, which is an endowed award that recognizes the efforts of a novice tutor, a senior tutor, and a graduate student annually.

College track faculty members also invest time and effort in teaching improvement activities. They are members of a number of professional organizations: the American Mathematical Association of Two-Year College (AMATYC), the New Mexico Mathematical Association of Two-Year Colleges (NMMATYC), the National Council of Teachers of Mathematics (NCTM) and the Mathematical Association of America (MAA) are the most common. Suzanne Hill and Amal Mostafa presented at the NMMATYC meeting in Farmington, NM in May and Sue Schibel presented at the AMATYC meeting in Salt Lake City in November. Representatives from the college faculty also attended the national meetings of the NCTM, the International Conference on Technology in Mathematics, and the Sun Conference on Teaching and Learning, and presented summaries of what they learned to their colleagues. Many of them regularly take advantage of teaching improvement workshops offered on campus.

Mathematics Learning Center staff and graduate assistants also participated in an experimental "math boot camp" sponsored by the College of Engineering, which brought together a number of engineering freshman for a week-long concentrated review and practice of pre-calculus mathematics. The goal was to see if participation in the boot camp would improve the scores of the students on

the Mathematics Placement Exam enough for them to gain entry to mathematics courses they really wanted to take.

Several faculty members developed interests in the mathematical education of future teachers. Many of them regularly teach the mathematics content courses which we offer from the beginning undergraduate (Math 111) to the doctoral level (Math 561). Professor Finston served on the Education Council in the spring of 2003. Dr. Finston has committed the department to develop from six to eight new courses, to be deliverable online, to support the Master of Arts in Teaching Mathematics degree administered by the College of Education. In June of 2003, Dr. Kurtz and Dr. Morandi developed material for the first of these courses, a course in linear algebra. Dr. Kurtz piloted some of the material in a section of Math 280 offered in fall 2003, and he will make the first offering to the degree candidates in spring 2004. Dr. Finston has obtained support for spring 2004 to develop a second course, to be offered on-line in Fall 2004. The audience for these courses consists of middle school teachers of mathematics. Dr. Susana Salamanca Riba is working with Dr. Lisa Snow and Ms Kathe Kanim on a proposal to the Institute for Advanced Study/Park City Mathematics Institute to establish a Professional Development and Outreach group for high school and middle school teachers in New Mexico. The concept calls for interaction between NMSU faculty and teachers; Dr. Baggett's models of partnership classes may also be used to improve the content knowledge of in-service teachers in the areas of algebra and analysis and to motivate the preservice teachers in Math 331 and Math 332 to perform at higher levels.

### **3.2. Student Advising**

Student advising is handled by special departmental committees. Undergraduate mathematics majors are advised by members of the Undergraduate Majors/Minors Committee. This committee nominates mathematics majors for scholarships and awards and informs them about study and career opportunities. The department is sponsoring a chapter of the undergraduate mathematical honor society Pi Mu Epsilon. Through meetings and activities of this organization, undergraduates get acquainted with faculty on a more informal basis, and with graduate students. The Undergraduate Curriculum Committee coordinates the update of our course offerings, syllabi, and information provided to instructors.

Outside of advising for regular classes, Professor Caroline Sweezy and Emeritus Professor Richard Bagby provide coaching for students interested in the presti-

gious Putnam Examination, a national competition sponsored by the Mathematical Association of America. Dr. Robert Smits is coaching and advising students interested in the actuarial exam sequence. As the national actuarial societies are interested in reaching out to minorities underrepresented in the profession, he sees great potential in a program at NMSU to support preparation of students for actuarial careers.

Advising of graduate students is coordinated by the Graduate Studies Committee, which also makes recommendations for graduate assistant appointments, coordinates comprehensive exam preparation and grading, and updates our graduate course offerings. The Graduate Studies Committee is fine-tuning a significant overhaul of our requirements for the doctorate. These included, for the first time, course requirements in addition to successful completion of the comprehensive exam. One of the goals of our program that was found in need of improvement by our outcomes assessment process is that Ph.D. students should acquire significant breadth in mathematics beyond the area of the thesis. The course requirement will enable us to better meet that goal.

Members of the department advise for the Advising Center and the Honors program and many advise secondary mathematics education majors. Members of the department contributed 65 hours to the Arts and Sciences Advising Center and Elaine Cohen earned half graduate assistant support by working in the Advising Center. The department rigorously enforces prerequisites for our courses. Professor Sweezy handles most of the advising for Supplementary Majors in Applied Mathematics.

Jane Els is assigned as Special Students Program Coordinator to monitor students who are handicapped, have learning disabilities, or are experiencing great difficulties in their classes. She is also the MLC liaison to Student Services and American Indian programs and the department ADA coordinator.

### **3.3. Graduate Studies**

Graduate enrollment in the department had declined to 38 mathematics graduate students enrolled in Masters and doctoral programs by the end of Fall 2003, far below the record of 48 in 2001. Two Mathematical Sciences graduate students were awarded master's degrees and three were awarded doctorates during the year. Just before the start of the fall term two foreign students who were transitioning from engineering programs to mathematics resigned assistantships in order to complete engineering degrees and return to their home country as soon

as possible. During the fall semester two more students withdrew for health reasons. Thirty two graduate students hold graduate assistantships and one more is supported on a college instructorship. Nine of our graduate students are female, two are citizens of Mexico, and four are members of minority groups. The department is home to 3 AGEP fellows. Since 2001 we have witnessed the practically complete disappearance of applications for graduate study from the Middle East. In 2002 we had six graduate students from the Middle East, two finished their doctorates in 2002, a third finished a doctorate in 2003. One found a tenure track position in the United States, and the other two were obligated to return to the Middle Eastern universities where they had been teaching and which had partially supported their studies in the United States. These students had been well-prepared, with substantial Master's programs behind them, and highly motivated; it is unfortunate that a new generation has not reappeared to replace them. However, contacts Professors Hung Nguyen and Tony Wang have developed with universities in Thailand are expected to bring new graduate students to NMSU starting in the spring of 2004. Recruiting quality American students will be a priority and competition with other universities for these students will be considerable. Our recruiting efforts in the minority community and in area colleges and universities continue. As incentives, the department can appeal to the Sloan Foundation for additional support of minority students, as soon as the number of minority graduate students reaches a higher level, and the National Science Foundation awarded NMSU the AGEP grant for similar purposes in a broader spectrum of scientific disciplines. In the department two continuing students had support from the AGEP program, and a new student has also been named an AGEP fellow. This student was recruited with the help of the AGEP program and with the help of the NMSU Mathematics Association Fund. In spring 2003, the department brought 5 promising applicants for graduate study to campus. The AGEP program and the Association Fund helped cover expenses of the visits, and, in one case, partially covered the expenses the student incurred to move his family to Las Cruces. Two of the five students finally enrolled. We plan to continue to use campus visits as a recruiting tool, and appreciate the support the graduate school is offering for candidate visits.

The department offers a Basic Notions seminar designed specifically to introduce faculty and graduate students to topics in various areas of contemporary mathematics. At advanced levels, the faculty support seminars in analysis, statistics, applied mathematics, topology, algebra, lattice theory, and functional analysis. Most faculty strongly recommend that pre-oral comprehensive Ph.D.

candidates present in appropriate seminars and require dissertation level Ph.D. candidates to present. In 2002 the department approved a plan to broaden the areas on which doctoral students can be examined for the written portion of the comprehensive exam. The motivation for this is to enable them to progress more rapidly to thesis work in a broader array of mathematical areas (e.g. statistics, applied mathematics, logic, and mathematics education). Along with this change, new two semester doctoral level course sequences were developed in logic/universal algebra and ordinary/partial differential equations. Doctoral course sequences in mathematics education remain in development. To ensure that our doctoral students will have the breadth of mathematical knowledge necessary for successful careers course requirements were also instituted in 2002. This year the graduate studies committee has reworked the scheduling of graduate courses to make it easier for students to prepare some of the new topics on the written comprehensive examination and is improving student advising and tracking so that Ph.D. students will not get “hung up” at the comprehensive examination stage.

### **3.4. Undergraduate Program**

At the end of 2003, the Undergraduate Majors and Minors Committee reported 48 mathematics majors (39 first majors and 9 second majors) and 13 students enrolled in the supplementary major in applied mathematics. This gives the department the highest enrollment since 1991, when the secondary mathematics education majors were still counted among the mathematics majors.

We have partial information about May 2003 graduates. Math major Ms. Naomi Martinez was honored as outstanding Arts and Sciences Senior at the May 2003 Commencement; she accepted an offer from the University of Michigan for full support for four years of graduate study. Mr. Lance Miller also graduated in May 2003, and was recruited by the University of Connecticut and the University of Maryland for their graduate programs. He chose to go to Connecticut, and, reportedly, is doing well there. Andrea Magby entered the graduate program in mathematics here at NMSU.

Concerning December 2002 graduates, we have the following partial information Shannan Wright has become a middle school teacher in Fort Worth, Texas. Vakhid Masagutova entered graduate study in mathematics at Purdue University in Fall 2003, and Sarah Ellis, Richard Eric Moreno, and Charles Mundy-Castle are graduate students in mathematics here at NMSU. Kevin Streander became a graduate student in NMSU’s computer science department and has been employed

at PSL on Joe Lakey's AFOSR grant.

In 2003 the undergraduate majors and minors committee was able to increase the diversity and the number of students receiving scholarship money from the department's scholarship resources. The committee proposes to offer start-up scholarships to students transferring from two-year colleges and to identify entering students with higher math scores on the ACT and contact them about becoming mathematics majors. To better track recent graduates is another item on which some progress would be easy to make. Looking into the longer term, the committee would like the department to devote space for a lounge for undergraduate majors and to redesign some existing courses for mathematics majors to make them more attractive to potential new majors. At the moment it is difficult to imagine where the space for the lounge might be found.

### **3.5. Outreach**

The department engages in outreach activities both within and external to the university. The Liaison Committee was established in 1997 to contact faculty members from client departments and contact mathematics departments at branch campuses for their feedback concerning the content of mathematics courses. We have been working with the Computer Science department to update the course requirements that we have in common. A grant awarded by the National Science Foundation to faculty in the two departments will result in new course materials based on classic mathematics papers that laid the foundations for computer science. The Undergraduate Curriculum Committee is developing a proposal to alter our scientific calculus sequence. Since the College of Engineering provides the majority of students in these courses, modifications will be done in consultation with their faculty.

Educational outreach activities included visits to area public, elementary, middle, and high schools to speak to students and the development of an online high school mathematics contest. Professor Baggett teaches a series of partnership courses in which NMSU students are matched with active Las Cruces area high school teachers. The contest was held in Spring 2003 with 5 teams from Las Cruces area high schools participating. An awards ceremony was held, with prizes supplied by MacKichan Software and the department. The contest will again be held in spring 2004, but the date is still open.

Department members were again active in the PREP program. The program encourages disadvantaged middle school and high school students to study

mathematics and science through an intensive summer program of enrichment activities. The recently funded Health Careers Opportunity Program (HCOP) grant also provides academic and nonacademic support to middle and high school students from a wide area of southern New Mexico and aims to encourage them to consider health careers. The Department provided HCOP with online mentoring and tutoring and instruction in the summer enrichment program held at NMSU in summers 2003.

A considerable amount of effort has been devoted to the Mathematics Placement Exam (MPE). An online version of the MPE became available in Spring 2003. At the math teachers request, the MPE was administered on site at three area high schools in Spring 2003. An article in the Chronicle of Higher Education reports on perceived mismatches between what is required for success on current high school achievement tests and what is required for success in college; the article "Gains in Houston Schools: How Real Are They?" in the December 3, 2003 New York Times reports on comparisons of student performance on state tests with performance on national standardized tests, comes to some disturbing conclusions, and points out through case studies that the mismatch can be quite severe. We will definitely continue our activities to make clear to schools what their students need to succeed at NMSU.

The department participated in many recruiting activities for the university. A faculty member is designated as the coordinator of Visitor's day activities. We participated in all Aggie Experiences, and in Visitor's Day and the Majors Fair as fully as possible. Members of the undergraduate majors and minors committee conduct interviews and tours of the department for prospective students visiting the campus.

College Assistant Professor Alyne Fulte and Dr. Staffeldt have prepared a departmental newsletter, whose first issue should be mailed before the end of the semester. The newsletter will complement the activities of the NMSU Mathematics Alumni Association. The Association has a web page, and posts news items occasionally. Also, the Association and the department sponsor a reception at the annual winter joint meeting of the American Mathematical Society and the Mathematical Association of America. Generally, about 25 faculty, emeriti, friends, and former students attend the reception. The newsletter will reach all alumni for whom we have postal addresses, which is, of course, a much larger group. In time we hope the newsletter contribute to the formation of a larger community with an interest in the activities of the department. We are also sending copies of the newsletter to high schools throughout the state. The goal is to assist in

recruitment and to reach some of the secondary mathematics education majors, most of whom have taken many courses in the department.

#### **4. Research and Other Scholarly Activities**

Members of the department were productive researchers. Twenty one of the tenure-track faculty members had forty-nine papers appear in print in 2003. Faculty members delivered many talks on their research at conferences and at other universities.

Members of the department conduct joint research with mathematicians at other institutions. Some highlights of this type of activity include: Professor Swanson spent part of her sabbatical at the Mathematical Sciences Research Institute, along with a doctoral student from the department. In collaboration with Professor Craig Huneke, she has submitted chapters from a monograph on advanced topics in commutative algebra to the Cambridge University Press for consideration for publication. Professor Gehrke is writing a research text with a distinguished mathematician at Oxford University. Professors Sikora and Lakey conduct joint research with colleagues in Australia, and Professor Krupa has an ongoing program with faculty in Vienna and Copenhagen. Professor Hung Nguyen has numerous research collaborations, many with mathematicians in the far east. He brokered an agreement between NMSU and Assumption University, Thailand for research collaborations and exchanges of graduate students and faculty.

The department sponsors a weekly colloquium and several weekly seminars. The colloquium series included 34 lectures during the year, most of them presented by visitors to NMSU. Speakers from other institutions visit the department to collaborate with our faculty on their research. A few of the talks were presented by members of other departments on campus, explaining how they use mathematics in their research. The seminars specialize in algebra, analysis, cryptography, lattice theory, statistics, topology, and fuzzy mathematics. The “Basic Notions” is a more informal, general interest seminar. This year we began the practice of devoting one Basic Notions seminar each month to a topic of interest to undergraduates. This seminar is followed by a reception for undergraduate members of the newly reorganized club for mathematics majors. The New Mexico Analysis seminar is a joint venture between the mathematics faculty of NMSU and UNM. The Spring 2003 session was held at NMSU and featured talks by NMSU graduate students as well as talks by distinguished established mathematicians. A proposal for continued support of the seminar by the NSF is pending.

Faculty members participate in interdisciplinary research. Professor Sikora has been conducting joint research with Professor Ray Lyman of Electrical Engineering. Professor Lakey collaborates with staff at PSL and Statisticians Hung Nguyen, Nhu Nguyen, and Tony Wang consult with researchers around campus. Professors Ballyk and Barany submitted a paper representing joint research with a Ph.D. candidate in biology. College Assistant Professor Linda Zimmerman published a joint paper in Economics.

Faculty members participate in interdisciplinary scholarship as well. An NSF education grant awarded in 2002 supports Drs. Bezhanshvili, Lodder, and Pengelley and Drs. Leung and Ranjan from computer science while they develop material for teaching discrete mathematics using original historical sources. Their work will be piloted in courses like Math 279, Math 330, Math 430, and Math 454/504. It has the potential to be a very influential development in mathematical pedagogy.

Twenty five faculty were associated with more than fifty grants and proposals for external funding in 2003. In 2003 there were six new grants awarded: one NSF grant to Jens Funke for individual research, an NSA Young Investigator's Grant award to Bruce Olberding for his research, a grant from Hewlett Packard on which Associate Head Kitty Berver is a co-PI to support engineering student retention, a grant to a PI in biology for which Mary Ballyk contributes to the development of courses in mathematical biology, and two grants involving John Harding and Irena Swanson to support conferences. There are thirteen proposals pending for grants to support individual and group research, conferences at NMSU, UNM and other locations, and educational projects.

The competition for grants to support research in mathematics is intense. I have asked faculty to include in their annual reports feedback from program administrators and reviewers. One faculty member reports that a proposal that received three "very good" ratings (only "excellent" is a higher rating) was declined; the NSF program area funded around 23% of the proposals. Another faculty member reported his proposal was declined by an NSF program area that funds around 1/3 of the proposals. Faculty are working very hard to raise the success rate, by consulting with potential reviewers, with program directors, with mentors, and through participation in such programs as the Bauer seminar on proposal writing that was offered at the beginning of the year. The National Security Agency announced an award to Dr. Bruce Olberding in early fall, with the amount to be awarded to specified later. In late November, Dr. Olberding received notice that cuts in the NSA budget compelled the agency to reduce the

amount of his award to zero.

## 5. Professional Service Contributions

Members of the department play an important service role in the mathematical community. The department is an institutional member of the Association for Symbolic Logic, the American Mathematical Society (AMS), the Mathematical Association of America (MAA), the Society for Industrial and Applied Mathematics (SIAM), the American Mathematical Association of Two-year Colleges (AM-ATYC) and the Association for Women in Mathematics (AWM). It is an institutional sponsor of the *Pacific Journal of Mathematics* and a member of the Rocky Mountain Mathematics Consortium. Many members of the department served as referees for journals and books, reviewers for the two major mathematical abstract journals, and referees for grant proposals to the National Science Foundation and other organizations. Faculty members took part in conference organizing committees and organized special sessions at national and international conferences sponsored by professional societies. Lolina Alvarez, Hung Nguyen, Nhu Nguyen, John Harding, David Pengelley, and Irena Swanson served on editorial boards of professional journals. Professor Jerry Lodder is the department's representative to the Rocky Mountain Mathematics Consortium. Professor David Pengelley is a member of a committee of the MAA. Professor Smits serves as the department's representative to the Mathematical Association of America (MAA). Doug Kurtz is a member of two committees of the American Mathematical Society and two committees of the Mathematical Association of America.

The department plays a major role in the university's service mission. Professor Ted Stanford is a member of the University Senate, and Professor Lolina Alvarez was a member of the University Graduate Council until August 2003. She was also a member of two committees of the NM AGEP program. The department provided advice and assistance to the College of Arts and Sciences with representatives on the Curriculum and Educational Policies and Research Affairs Committees. Mathematical Sciences faculty served as outside members on tenure and promotion committees for the Departments of Astronomy, Computer Science, English, Languages and Linguistics, and Physics. Faculty members also served as advisors in the College of Arts and Sciences Advising Center, advisors to several student organizations, and Dean's representative on many graduate student exam committees external to the department. . All department faculty members participated in committee work within the department.

## 6. Community Service and Relations

Working with groups and agencies outside the university is important to the department. Several faculty members worked with Las Cruces Public School students and teachers.

The department has been involved in the New Mexico Commission on Higher Education Mathematics Articulation Task Force, which coordinates the transfer of credits for mathematics courses among the institutions of higher learning in the state. Currently, Professor Kitty Berver is cochair of the task force, which meets periodically to update information. She is responsible for maintaining the internet-accessible database that articulates transfer credits.

The department has increased and improved its interactions with local public schools. Patricia Baggett continues to run her Math 111 (Fundamentals of Elementary Mathematics I) and Math 112 G (Fundamentals of Elementary Mathematics II) classes concurrently with special topics Math 301 and Math 501 courses for pre and in-service teachers. Elementary education majors in these courses are paired with practicing teachers enrolled in the concurrent graduate course, who act as mentors to the pre-service teachers, allowing them to observe, co-teach, and finally teach alone, in their classrooms. The in-service teachers received free tuition with funds provided by a grant from the New Mexico Commission on Higher Education and from NASA. This grant closes in December 2003. The administration of the Las Cruces Public Schools and, in particular, the Teachers' Center have been highly supportive of this initiative. Dr. Baggett is also a member of the board of directors of the Science Education Alliance, which promotes contact between faculty at NMSU and teachers in Las Cruces Public Schools.

Professor Baggett continues her practice of teaching a class a week in elementary and middle schools, and she served for three weeks as a substitute math teachers when a fifth grade teacher at Tombaugh Elementary fell ill. Several other faculty members are frequent visitors to area schools. In Spring 2003 the department elevated its practice of making visits to high school classes a recognized service activity. The outreach committee under Dr. Gehrke coordinates these activities this year. David Finston and Linda Zimmerman is attending monthly meetings with teachers, as well.

The department maintains several display cases in public areas in Science Hall, in the classroom wing and near the department office. These help to introduce visitors to the members of the department and to give timely information about mathematical topics of current interest.

Two faculty members serve on a joint committee with members of the Doña Ana Branch Community College mathematics faculty. Their activities include working to develop a smooth transition from branch college to main campus mathematics courses, arranging mini-conferences involving members of both faculties at the beginning of each semester

The department supports university and state activities by providing space for organizations on campus. It continues to house the university's Women's Studies Program, and a seminar room has been converted into an office for the southern coordinator for the New Mexico MESA (Mathematics Science Engineering Achievement) program.

## **7. Outcomes Assessment Activities**

### **7.1. Undergraduate Outcomes Assessment Activities**

The department's undergraduate program evaluation includes a survey to be completed by all Mathematical Sciences faculty teaching courses in which at least one mathematical sciences major is enrolled. The survey was devised by Richard Bagby in collaboration with the Undergraduate Majors/Minors Committee. The questions to be answered for each mathematical sciences major are:

1. Does the student display the ability to understand definitions and use them in appropriate situations? Often /Seldom
2. Does the student display the ability to complete explicit calculations and derivations? Often /Seldom
3. Can the student clearly express a written mathematical argument? Often/Seldom
4. Does the student display the ability to apply theoretical knowledge to solve problems? Often /Seldom
5. Does the student demonstrate a degree of mathematical maturity? (Indications of this are the ability to think of a problem in several ways, to anticipate developments in course material, to relate the subject material to other courses in meaningful ways.) Often /Seldom

Faculty are also asked to justify their responses, indicating the methods by which they arrived at the assessment.

In spring 2003 Dr. David Finston attempted to schedule exit interviews with graduating seniors, with limited success. In fall 2003 the majors and minors committee is helping with this task, and is also having trouble getting students to appear for interviews.

The report of the department on outcomes assessment activities for 2002 received a 0 rating, a drop from a 3 the year before. A meeting of the head, members of the department, Dean Brown, and Professor Mike Johnson representing the Outcomes Assessment Committee of the University was held to identify actions to put the department's undergraduate outcomes assessment activity back on track.

**Results of Assessment Activities** Despite the low rating of the program report, outcomes assessment and assessment of student learning is taking place and is having effects. Instructors of the two "theoretical" courses Math 331 and Math 332 required of all mathematical sciences majors and all secondary math education majors agreed that these courses need serious revision. David Finston and Patrick Morandi have revised the content of Math 331 and are collaborating on a text with the revised content. Dr. Douglas Kurtz is working on a book for Math 332 that he expects will address some of the problems of the students in this course.

## **7.2. Graduate Outcomes Assessment Activities**

The assessment of our graduate program includes a survey of graduates with advanced degrees and evaluation of the performance of our graduate students on master's and doctoral examinations. In 1999 we instituted a questionnaire administered to the chairs of graduate examining committees for the oral comprehensive exams and final orals for the master's and doctorate. The intent is to assess whether the examinee demonstrates mathematical breadth and content specific knowledge appropriate to his or her level. Six students had passed final oral examinations in 2002 and the questionnaires were administered at these exams, but no report on the activity was filed. Our graduate outcomes assessment program therefore dropped from level 3 status to unrated. In 2003 five students passed final oral exams, and other students passed oral comprehensive exams, where data is also collected, so we will have a report to file in February, 2004.

**Results of Assessment Activities** The information we had received from our established assessment activities, along with the new breadth of research interests in the department, led to a proposal to expand the subject areas on which students can be examined for the written part of the doctoral comprehensive and to impose course requirements for our doctoral students. The revision enables students to progress more rapidly into research leading to a doctoral dissertation. It necessitated course revisions since the written portion of the comprehensive exam is based on year long course sequences at the 500 level. Therefore an area can be considered as an examination area only if there is a year long sequence of 500 level courses upon which to base the examination. New areas that were included are statistics, applied mathematics, and logic/universal algebra. The revision includes course requirements to ensure that our Ph.D.s have appropriate breadth in several mathematical areas. We should start to see effects of the changes as Ph.D. students pass through their comprehensive exams in the coming year.

## 8. Computing Facilities

The department made a significant advance in oversight of its computing facilities. In August the Computer Operations Group acquired a second permanent full-time staff member, Min Li. John Pierce and Min Li are to be commended for their work in attempting to protect our network from possible damage due to hackers and viruses. Despite their efforts, our local network was seriously disrupted in late August and early September, with the result that a significant amount of work accomplished over summer by Math Learning Center staff was lost or destroyed. The department currently has 20 *Unix* computers, including two *Sun* servers, 139 *IBM* compatible PC's and 20 printers. In addition, the mobile wireless mathematics education laboratory has 29 laptops. Thus, when the lab is in use, the department can have as many as 183 machines on the network at one time. Additionally, there are two PC/overhead projector combinations, fixed projectors in two classrooms, and 4 laptops that can be checked out by teaching staff for instructional purposes. These machines are used by faculty members and graduate students for research and for the preparation of teaching materials. The department purchased the fixed overheads and laptops through funds provided by external grants. In 2003 we obtained funds to improve and move our wireless laptop laboratory/classroom from Walden Hall 27 to Walden Hall 232; The mathematics education laboratory/classroom became fully operational in Spring 2003 as a mobile wireless classroom. Funding for this lab came

largely from grants awarded by NASA and the Department of Education Title V program. With the support of additional funds from the Title V grant Walden Hall 27 became a computer classroom with 27 PCs to support the developmental mathematics program. Walden Hall 27 is used for the computer-versions of Math 115; to support students taking this version of the course the department also installed 4 PCs in the Math Learning Center.

The department maintains two more computer labs; we attempt to keep both hardware and software up to date. The undergraduate lab houses thirty five networked personal computers, equipped with the mathematics word processing and computing software, *Scientific WorkPlace*, and the symbolic computing software, *Maple*. This lab has been used for students in calculus, linear algebra and several graduate-level courses. Twenty one of these machines, put into service about five years ago, are now outmoded and are not up to the demands of the software faculty and students would like installed on them. Software requirements for hard disc space, for high speed memory, and for high clock speeds have made the machines obsolete. We have applied for funding to renew the machines in the undergraduate laboratory. The graduate students' lab is equipped with 9 UNIX machines and three personal computers.

The department has ongoing needs for renewal of computing equipment and for advanced software for educational uses just to maintain current programs. The Mathematics Learning Center is experimenting with computer-based courses, and we have learned that the use of these programs pushes our older laboratory machines to their limits. Looking toward the future, the contemplated revisions to the calculus curriculum could possibly include computer-assisted learning, which would increase our needs for equipment and permanent staff to maintain it even more.

## 9. Advanced Degrees Awarded in 2003

| Name  | Degree   |
|---|----------|
| Parag Mehta<br>Advisor: David Finston                       | Ph.D.    |
| Hyunju Oh<br>Advisor: Ross Staffeldt                        | Ph.D.    |
| Khaled Bataineh<br>Advisor: Ted Stanford                    | Ph.D.    |
| Kate Leach<br>Advisor: David Finston                        | Master's |
| Hailin Sang<br>Advisors: John Harding, Stefan Schmidt (PSL) | Master's |

Dr. Mehta has assumed a tenure-track faculty position at Westfield State College, one of the nine state colleges of Massachusetts; Dr. Oh has assumed a tenure-track faculty position at the University of South Carolina at Salkahatchie, a branch campus; and Dr. Bataineh has returned to Jordan to resume teaching at the university that partially supported his doctoral studies. Mr. Sang has entered a Ph.D. program at McGill University in Canada.

## Departmental Colloquia for the year 2003:

- Bernd Krauskopf, University of Bristol, *Computing (un)stable Manifolds: From the Lorenz System to Delay Differential Equations*. January 23.
- ✓ • Todd A. Grundmeier, University of New Hampshire, *Pre-Service Teachers' Problem Posing Abilities and Beliefs About the Relationship Between Problem Posing and School Mathematics*. January 28.
- Grisy Winicki Landman, Technion, Israel, *Families of Functions and Functions of Proof*, January 30.
- ✓ • Patrick Leenheer, Arizona State University, *A Feedback Perspective for Chemostat Models With Crowding Effects*, February 13.
- ✓ • Demtrio Labate, Washington University in St. Louis, *A Unified Theory of Reproducing Function Systems*, February 17.
- Maria Cristina Mariani, Purdue University, *Extreme Events in Financial Markets*, February 25.
- Mary Ballyk, New Mexico State University, *Interspecies Competition Under Multiple Resource Limitation*, February 27.
- Annie and John Selden, Tennessee Technological University, *Validations of Proofs Considered as Texts: Can Undergraduates Tell Whether an Argument Proves ATheeroem?*, March 13.
- Caryn Werner, Allegheny College, *The Existence and Moduli Problem of Algebraic Surfaces With  $p_g = 0$* , March 20.
- Welon A. Lodwick, University of Colorado at Denver, *Being Certain About Uncertainty*, April 3.
- Nicholas Vakhania, Institute of Computational Mathematics, *Georgian Academy of Sciences, Sylvester Matrices, Brunel-Sucheston Spreading Model and Dvoretzky-Rogers Theorem*, April 4.
- Jens Lorenz, The University of New Mexico, *The Role of the Pressure in Potential Blow-up of Solutions of the Navier-Stokes Equations*, April 8.

- Rodrigo Banuelos, Purdue University, *Generalized Isoperimetric Inequalities*, April 10.
- Kathleen Berver, New Mexico State University, *The Mathematics Learning Center at NMSU*, April 15.
- Steve Schaffer, New Mexico Tech, *Application of Differential Geometric Control Methods to Network Dynamical Systems*, April 17.
- Dante DeBlassie, Texas A&M University, *Iterated Brownian Motion in an Open Set*, April 22.
- Charles Thomas, Cambridge University, England, *Geometry and  $v_n$ -periodic Cohomology Theories*, April 24.
- Morwen Thistlethwaite, University of Tennessee, *Computations in Knot Theory*, August 28.
- David Finston, New Mexico State University, *Recent Progress About Polynomial Rings*, September 18.
- Joseph Lakey, New Mexico State University, *Almost Everywhere Convergence, Revisited*, September 25.
- Arthur Knoebel, New Mexico State University, *Cayley-like Representations Are For All Algebras, Not Merely Groups*, September 30.
- Christopher Eyral, Tokyo Metropolitan University, *On the Fundamental Groups of the Complements of Plane Algebraic Curves*, October 9.
- Sebastian Wieczorek, Sandia National Laboratory, *Homoclinic Teeth and Excitability in Optically Driven Lasers*, October 16.
- Mercedes McGowan, William Rainey Harper College, *Developing Mathematical Thinking and Reasoning: A Focus on Building Connections*, October 23.
- Jeffrey Adams, University of Maryland, *The Atlas of Lie Groups and Representations*, November 6.
- De-Jun Feng, Georgia Tech, *Statistical Inference Based on Set-valued Observations*, November 13.

- Ruxandra Moraru, University of Toronto, Canada, *Vector Bundles and Elliptic Fibrations*, November 20.
- Rick Ball, University of Denver, *Configurations of Coproducts of Priestly Spaces*, December 4.

## 10. International Activities 2003

### 10.1. Colloquia

- Bernd Krauskopf, University of Bristol, *Computing (un)stable Manifolds: From the Lorenz System to Delay Differential Equations*. January 23.
- Grisy Winicki Landman, Technion, Israel, *Families of Functions and Functions of Proof*, January 30.
- Nicholas Vakhania, Institute of Computational Mathematics, Georgian Academy of Sciences, *Sylvester Matrices, Brunel-Sucheston Spreading Model and Dvoretzky-Rogers Theorem*, April 4.
- Charles Thomas, Cambridge University, England, *Geometry and  $v_n$ -periodic Cohomology Theories*, April 24.
- Christopher Eyrat, Tokyo Metropolitan University, *On the Fundamental Groups of the Complements of Plane Algebraic Curves*, October 9.
- Ruxandra Moraru, University of Toronto, Canada, *Vector Bundles and Elliptic Fibrations*, November 20.

### 10.2. Department Visitors

- Peter van Rossum, University of Nijmegen, visited through Spring 2003.

### 10.3. International Research Collaborations

- Ross Staffeldt conducts joint research with colleagues in Germany.
- Irena Swanson conducts joint research projects with faculty in Italy and Germany, among others.

- John Harding conducts research with colleagues in the Czech Republic and Canada.
- Pat Morandi does collaborative research with Susanne Pumpluen, University of Regensburg.
- Joe Lakey does collaborative work with colleagues in Australia.
- Adam Sikora does collaborative work with colleagues in Australia.
- Elizabeth Gasparim does collaborative work with colleagues in England and Italy.
- David Finston conducts joints research with colleagues in the Netherlands.
- Martin Krupa collaborates with colleagues in Vienna.
- Mai Gehrke does collaborative work with colleagues in Denmark, Portugal, and England.
- Lolina Alvarez does collaborative work with colleagues in Argentina and Mexico.
- Hung Nguyen does collaborative work with colleagues in Thailand.
- Nhu Nguyen does collaborative work with colleagues in Australia.
- Tony Wang does collaborative work with colleagues in Taiwan and China.

#### **10.4. International Service**

- Lolina Alvarez is US Liaison of the Argentine Mathematical Union
- Douglas Kurtz served on the academic advisory board for the University of the United Arab Emirates; he has also been engaged as an educational consultant for the Mathematical Sciences Institute of the Australian National University.

## 10.5. International Lectures

- Josefina Alvarez was invited to present a talk at the summer meeting of the Canadian Mathematical Society in Edmonton, Alberta.
- Mary Ballyk lectured at the Fourth Geoffrey J. Butler Memorial Conference on Differential Equations and Mathematical Biology in Edmonton, Alberta.
- Jens Funke lectured at the Mathematisches Forschungsinstitut, Oberwolfach, Germany, at the Humboldt University, Berlin, and at the Fields Institute, Toronto.
- Elizabeth Gasparim lectured at a conference in Porto (Portugal) and at the University of Lisbon.
- Mai Gehrke lectured at international conferences in Tbilisi, Georgia; in Lisbon, Portugal; and at Oxford University.
- Tiziana Giorgi lectured at the Fields Institute in Toronto, at the International Society of the Arts, Mathematics, and Architecture meeting in Granada, and at the University of L'Aquila, Italy.
- John Harding lectured at a conference in Tbilisi, Georgia, at the University of Amsterdam, and at Oxford University.
- Martin Krupa lectured at a conference at the Fields Institute, Toronto.
- Joe Lakey spoke in two sessions at the 2003 Congress of the International Society for Analysis and Computation (ISAAC) at York University in Toronto.
- Pat Morandi lectured at the Rheinisch Westfaelische Technische Hochschule (RWTH) in Aachen, at University College in Dublin, and at the Università Degli Studi di Trento in Italy.
- Hung Nguyen spoke at an international conference in Thailand.
- Nhu Nguyen lectured at the National University of Hanoi.
- David Pengelley lectured at the Mathematisches Forschungsinstitut, Oberwolfach, Germany; at the University of Goettingen, Germany; at the University of Uppsala, Sweden; and at the 18th British Topology Meeting in Manchester, England.

- Susana Salamanca-Riba lectured at the Instituto de Matematicas, UNAM, Mexico City.
- Adam Sikora lectured at the University of Cergy-Pointoise, France, at the University of Sydney, at Macquarie University, and at the Australian National University.
- Robert Smits lectured at the International Society of the Arts, Mathematics and Architecture meeting in Granada, and at the University of L'Aquila, Italy.
- Irena Swanson lectured at the International Conference on Commutative Algebra and Combinatorics in Bangalore, India.
- Tony Wang lectured at Beijing Polytechnic University; Tsinghua University, Beijing; at Northwest University, Xian, China, and at conferences in Beijing and Chiang Mai, Thailand.

## Refereed Publications and Books Appearing in 2003.

### Josefina Alvarez

- (with Martha Guzmán-Partida, University of Sonora, Mexico, and Urszula Skórnik, Warsaw University of Agriculture, Poland)  $S'$ -convolution with the Poisson kernel in the Euclidean case and the product domain case, *Studia Mathematica* (156) (2) (2003) 143-163. This work was part of the research collaboration I proposed for the Manasse Chair Award competition.

### Ernest Barany

- Barany, Ernest and Maciej Krupa, "Emergence of critical rates in multiple access network control schemes," *Proceedings of 2003 IEEE Conf. on Decision and Control*, Maui, HI, December 2003, In press.
- Barany, Ernest and Maciej Krupa, "Emergence of critical rates in CSMA/CD type network control schemes," *Proceedings of 4th International Conference on Complex Systems and New England Complex Systems Institute Interjournal*, June, 2002.

## Guram Bezhanishvili

- Johan van Benthem, Guram Bezhanishvili, Mai Gehrke, “Euclidean hierarchy in modal logic”, *Studia Logica*, 75 (2003), 327-345.
- Guram Bezhanishvili, Ray Mines, Patrick J. Morandi, “Scattered, Hausdorff-reducible, and hereditarily irresolvable spaces”, *Topology and Its Applications*, 132 (2003), 291-306.

## Marcus Cohen

- "Clifford Tetrads, Null Zig Zags, and Quantum Gravity," *Advances in Applied Clifford Algebras*, **13**, 1 (2003).

## Elizabeth Gasparim

- *Vector bundles on a neighborhood of a curve in a surface and elementary transformations*, with E. Ballico, *Forum Math.***15** no.1, 115–122 (2003)

## Mai Gehrke

- Normal forms and truth tables for fuzzy logics, with C. Walker and E. Walker, *Fuzzy Sets and Systems: Special Focus Issue*, volume 138, number 1 (2003), pp. 25-51.
- Euclidean hierarch in modal logic, with Johan van Benthem and Guram Bezhanishvili, *Studia Logica* 75: 327-344, 2003.

## Tiziana Giorgi

- With C Werner, Nodal Lines and Quasi-Space Filling Curves, Proceedings of the ISAMA- Bridges International Conference, 2003 (Refereed publication).
- With R Smits, Remarks on the Existence of Global Minimizers for The Ginzburg-Landau Energy Functional, *Nonlinear Analysis, TMA*, Vol. 53, NO. 2, pp 147-155, 2003

## John Harding

- Bezhanishvili, G. & Harding, J., "Functional Monadic Heyting Algebras," *Algebra Universalis*, 48 (1): 1-10, 2002.
- Harding, J., "The Free Orthomodular Lattice on Countably Many Generators is a Subalgebra of the Free Orthomodular Lattice on Three Generators," *Algebra Universalis*, 48 (2): 171-182, 2002.

## Joe Lakey

- Lakey, J. and Wang, Y., "On perturbations of irregular Gabor frames, " *Journal of Computational and Applied Mathematics*, **155** (2003), 111-129.
- Lakey, J., and Pereyra, M. < " On the nonexistence of certain divergence-free multi-wavelets" in *Wavelets and Signal Processing*, L. Debnath, ed., Birkhäuser, Boston, 2003, 41-54.

## Jerry Lodder

- "From Leibniz Homology to Cyclic Homology," *K-Theory*, 27, (2002), 359–370. (Not listed on any previous annual report.)
- "Curvature in the Calculus Curriculum," *The American Mathematical Monthly*, 110, 7, (2003), 593–605.

## Maria Mariani

- The prescribed mean curvature equation for nonparametric surfaces. P. Amster, M. C. Mariani. *Nonlinear Analysis* 52 (2003) 1069-77.
- Solutions to H-systems by topological and iterative methods. P. Amster, M. C. Mariani. *Abstract and Applied Analysis* 9 (2003) 539-545.
- Solving Differential Equations with Unsupervised Neural Networks. D. R. Parisi, M. C. Mariani and M. A. Laborde. *Chemical Engineering & Processing*, Vol. 42, No. 8-9 (2003) 719-725.

- The Effects of the Asian Crisis of 1997 on Emergent Markets through a Critical Phenomena Model. M. G. Figueroa, M. C. Mariani, M. B. Ferraro. *International Journal of Theoretical and Applied Finance*, Vol. 6, 6 (2003) 605-612.

### Patrick Morandi

- Bezhanishvili, G., Mines, R., Morandi, P., “Scattered, Hausdorff-Reducible, and Hereditarily Irresolvable Spaces,” *Topology and its Applications* **132** (2003), 291-306.

### Hung Nguyen:

- On efficient representation of expert knowledge by fuzzy logic: Towards an optimal combination of granularity and higher-order approaches (coauthored with V. Kreinovich). Book chapter in *Recent Advances in Intelligent Paradigms and Applications* (A. Abraham, L. Jain and J. Kacprzyk, Eds.), *Physica-Verlag* (2003), 107-132.
- Why two sigma? A theoretical justification (coauthored with V. Kreinovich). Book chapter in *Soft Computing in Measurement and Information Acquisition* (L. Resnik and V. Kreinovich, Eds.), Springer-Verlag (2003), 10-22.
- Fast quantum algorithms for handling probabilistic, interval, and fuzzy uncertainty (coauthored with V. Kreinovich). In *Proceedings of 22nd International Conference of the North American Fuzzy Information Processing Society*, Chicago, Illinois, July 24-26 (2003), 395-400.
- On convergence of possibility measures (coauthored with T. Wang). *Proceedings of the International Conference on Fuzzy Information Processing*, Beijing, China, March 1-4 (2003), Tsinghua University Press, 43-47.
- Towards foundations of processing imprecise data (coauthored with T. Wang and V. Kreinovich). *Proceedings of the International Conference on Fuzzy Information Processing*, Beijing, China, March 1-4 (2003), Tsinghua University Press, 895-900.

- Dirty pages of logarithm tables, lifetime of the universe and subjective fuzzy probabilities on finite and infinite intervals. In *Proceedings of the 12th IEEE International Conference on Fuzzy Systems*, St.Louis, Missouri, May 25-27(2003), 67-73.
- Which truth values in fuzzy logics are definable? (coauthored with V. Kreinovich and A. Dinola). *International Journal of Intelligent Systems*, Volume 18, Number 10 (2003), 1057-1064.

### Nhu Nguyen

- The Highway dragon revisited (with Sze-Man Ngai), **Discrete & Computational Geometry**, **29(2003)**, **603-623**.
- Convolution of equicontractive self-similar measures on the line (with D.J. Feng and T. Wang), **Illinois Journal of Mathematics**, **46(2002)**, **1339.1351**. (This paper actually appeared in 2003, but it appeared in a volume of 2002).

### Bruce Olberding

- Bruce Olberding, "A geometric setting for some properties of torsion-free modules," *Rocky Mountain Journal of Mathematics*, vol. 32, (2002), 1281-1298.
- H. P. Goeters and Bruce Olberding, "The Krull-Schmidt property for ideals and modules over integral domains," *Rocky Mountain Journal of Mathematics*, vol. 32 (2002), 1409-1430.

### David Pengelley

- *The bridge between the continuous and the discrete via original sources*, in *Study the Masters: The Abel-Fauvel Conference, 2002* (ed. Otto Bekken et al), National Center for Mathematics Education, University of Gothenburg, Sweden, 2003. Attached.
- *A graduate course on the role of history in teaching mathematics*, in *Study the Masters: The Abel-Fauvel Conference, 2002* (ed. Otto Bekken et al), National Center for Mathematics Education, University of Gothenburg, Sweden, 2003. Attached.

- *Dances between continuous and discrete: Euler's summation formula*, in Proceedings, Euler 2K+2 conference, Rumford, Maine, 2002 (ed. Robert Bradley and Ed Sandifer), Euler Society, 2003. Attached.

### Adam Sikora

- Xuan Thinh Duong, El Maati Ouhabaz, Adam Sikora, Plancherel type estimates and sharp spectral multipliers. *J. Funct. Anal.* 196 (2002) 443-485 (This paper was not included in the reports previously submitted.)

### Robert Smits

- With Tiziana Giorgi “Remarks on the existence of global minimizers for the Ginzburg-Landau energy functional” *Nonlinear Analysis* 53 (2003) 147-155.
- “Square Decompositions with Hyperbolic Consequences in Art, Chemical Physics and Mathematics” refereed conference proceeding of the ISAMA-BRIDGES 2003 meeting held at the University of Granada, Spain

### Ted Stanford

- *On a map from pure braids to knots* (with Jacob Mostovoy). *Journal of Knot Theory and its Ramifications* 12 (2003) number 3, 417-425.

### Irena Swanson

- Hübl, R., and Swanson, I., “Normal cones of monomial primes”, *Math. of Comp.*, **72** (2003), 459-472.
- Swanson, I., “The first Mayr-Meyer ideal”, in “Proceedings of the Fourth International Conference on Commutative Ring Theory and Applications”, Fez, Morocco, June 7 - 12. Edited by Marco Fontana, Salah-Eddine Kabbaj, and Sylvia Wiegand. 2003, 435-444.

- Guerrieri, A., and Swanson, I., “On the ideal of minors of matrices of linear forms”, in “Proceedings of the Special Session on Commutative Algebra and Its Interaction with Algebraic Geometry and Conference on Commutative Algebra and Algebraic Geometry”, Edited by: L. Avramov, M. Chardin, M. Morales, and C. Polini. Contemporary Mathematics **331** (2003), 139-152.
- Rossi, M. E., and Swanson, I., “Notes on the behavior of the Ratliff-Rush filtration”, in “Proceedings of the Special Session on Commutative Algebra and Its Interaction with Algebraic Geometry and Conference on Commutative Algebra and Algebraic Geometry”, Edited by: L. Avramov, M. Chardin, M. Morales, and C. Polini. Contemporary Mathematics **331** (2003), 313-328.
- Swanson, I., “The minimal components of the Mayr-Meyer ideals”, *J. Algebra* **267** (2003), 127-155.
- Swanson, I., Commemorative quilt “Commutative algebra program 2002/03 at MSRI”. The quilt pictures the MSRI building with the five organizers. The quilt is on permanent display at MSRI. (You may view it at <http://emmy.NMSU.Edu/~iswanson/quilt.html>.)

## Tony Wang

- H. T. Nguyen and T. Wang, *On convergence of possibility measures*, Proceedings of International Conference on “Fuzzy Information processing”—Theories and Applications, Vol.1, 43 - 47 (2003). Tsinghua University Press and Springer.
- H. T. Nguyen, T. Wang, and V. Kreinovich, *Towards foundations of processing imprecise data: from traditional statistical techniques of processing crisp data to statistical processing of fuzzy data*, Proceedings of International Conference on “Fuzzy Information processing”—Theories and Applications, Vol.2, 895 - 900 (2003). Tsinghua University Press and Springer.
- *On probabilistic methods in fuzzy theory* (with Hung T. Nguyen and Berlin Wu), International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems, **18**, (2003).

- D. Feng, N. T. Nguyen, and T. Wang, *Convolutions of equicontractive self-similar measures on the line*, Illinois Journal of Mathematics, **46**(4), (2002), 1339-1351.

## 11. Summary of Grants and Grant Proposals in 2003.

### JOSEFINA ALVAREZ

| Title/Co-PI's  | Date Submitted | Agency           | Amount    | Duration    | Status   |
|--|----------------|------------------|-----------|-------------|--|
| NSF proposal number 0086986: New Mexico Analysis Seminar I am co-PI                          |                | NSF              | \$20,941  | three years | Awarded in 2002. The award was completed on June 30, 2003. |
| Subcontract of the NSF funded program NM Collaborative for Excellence in Teacher Preparation |                | NSF              | \$ 25,062 | two years   | The subcontract was completed on June 30, 2003.            |
| Proposal submitted to the NMSU NSF-ADVANCE program   |                | NMSU NSF-ADVANCE | \$14,095  | one year.   | Pending.   |

### PATRICIA BAGGETT

| <b>Title/Co-PI's</b>  | <b>Date Submitted</b> | <b>Agency</b>                   | <b>Amount</b> | <b>Duration</b> |
|---|-----------------------|---------------------------------|---------------|-----------------|
| Math & science Educators for the future(with Finston et al.)  | 1999                  | NASA                            | \$590,788     | Ends 12/31/03   |
| NMSU Title V Developing Hispanic-Serving Institutions Program (with Nassersharif, Morandi, Finston, et al.) | 2000                  | US Dept of Education            | \$1,019,702   | 5 years         |
| Prealgebra in elementary school and algebra in middle school (with A. Ehrenfeucht)                          | 2003                  | Inst. of Education Sciences/DOE | \$1,046,446   | 4 years         |
| Expanding a program of partnership mathematics courses through web development and grant preparation        | 2002                  | ADVANCE/NSF                     | ~\$20,000     | 2003            |
| Algebra for all: A new university math course for teachers and their students                               | 2003                  | Public Service of NM            | \$30,000      | 2004            |

### **MARY BALLYK**

| <b>Title/Co-PI's</b>   | <b>Date Submitted</b> | <b>Agency</b> | <b>Amount</b> | <b>Duration</b> | <b>Status</b> |
|--|-----------------------|---------------|---------------|-----------------|---------------|
| UBM: An Interdisciplinary Program in Mathematical Biology at New Mexico State University<br>PI: Dr. W. J. Boecklen<br>Principle Investigator: Dr. William Boecklen (Biology)<br>Other Participants: Dr. Ernest Barany (Mathematical Sciences), Dr. Amy Marion (Biology), Dr. Ralph Preszler (Biology). | June 2, 2003          | NSF           | \$100,311     | 2 years         | Fun<br>8/01   |

### **KATHLEEN BERVER**

| Title/Co-PI's  | Date Submitted | Agency | Amount       | Duration | Status                 |
|--|----------------|--------|--------------|----------|------------------------|
| HP Retention Grant<br>PI: Kathleen Berver. CO-PI;s<br>Susan Brown, Coll. of Edu.<br>Ricardo Jacquez, Coll. of Eng. |                |        | \$101,907.80 |          | Awarded<br>March 17, 2 |

### GURAM BEZHANISHVILI

| Title/Co-PI's  | Date Submitted | Agency    | Amount   | Duration | Status |
|--|----------------|-----------|----------|----------|--------|
| Applications of Topology and Universal Algebra to Modal Logic<br>Co-PIs: M. Gehrke, P. Morandi<br>J. Harding             | May 2002       | GRDF/CRDF | \$35,000 | 2 years  | Fund   |
| Teaching Discrete Mathematics via Original Historical Sources<br>Co-PIs: G. Lodder, D. Pengelley,<br>H. Leung, D. Ranjan | June 2002      | NSF       | \$74,432 | 2 years  | Fund   |

### MARCUS COHEN

| Title/Co-PI's | Date Submitted | Agency | Amount     | Duration | Status  |
|---------------|----------------|--------|------------|----------|---------|
| Axial Jets    | 12/03          | AFOSR  | \$1,290,00 | 2 years  | pending |

### DAVID FINSTON

| Title/Co-PI's   | Date Submitted | Agency             | Amount    | Duration   | Status |
|---|----------------|--------------------|-----------|------------|--------|
| Strengthening Hispanic Institutions (Title V)/<br>PI Rudi Schoenmackers | 1999           | Dept. of Education | \$175,000 | 2000-05    | Act    |
| MASEF/co PI with<br>Prentice Baptiste                                   | 2000           | NASA               |           | 2001-03    | Act    |
| Sloan Scholars  | 1999           | Sloan Foundation   |           | Indefinite | Act    |

### JENS FUNKE

| <b>Title/Co-PI's</b>  | <b>Date Submitted</b> | <b>Agency</b>                             | <b>Amount</b> | <b>Duration</b> | <b>Stat</b> |
|---|-----------------------|---|---------------|-----------------|-------------|
| Cycles in locally symmetric spaces of orthogonal and unitary type and modular forms | Oct. 2003             | NSF                                       | \$88,190      | 7/03-6/06       | fund        |
| US Junior Oberwolfach Fellow travel grants  |                       | NSF and Math. Forschungsinst. Oberwolfach | \$500         |                 | fund        |

**ELIZABETH GASPARIM**

| Title/Co-PI's   | Date Submitted | Agency | Amount | Duration | St |
|---|----------------|--------|--------|----------|----|
| Currently holding a research grant as an associate fellow of the International Centre for Theoretical Physics, Trieste, Italy |                |        |        |          |    |
| Currently holding a grant from the NMSU ADVANCE program, that gives me a course release each semester.                        |                |        |        |          |    |
| proposal of an NMSU mini-grant for a visit to Tokyo Metropolitan University pending, currently under review.                  |                |        |        |          |    |
| proposal for an NSF grant in Topology, pending, attending review.   |                |        |        |          |    |

**MAI GEHRKE**

| <b>Title/Co-PI's</b>   | <b>Date Submitted</b> | <b>Agency</b>   | <b>Amount</b>  | <b>Duration</b> |
|--|-----------------------|---|----------------|-----------------|
| Alg. ext. in logic   | Oct. 1, 2003          | Carlsberg Found.  | 373,101.00 DKR |                 |
| Ordered Alg. Str.:<br>Rep., Duality, and<br>Applications       | Oct. 1, 2003          | NSF   | \$188,411.00   |                 |
| Lattice-Ordered<br>algebras and<br>applications                | Nov. 3, 2003          | NSF-Advance<br>Professional<br>Development              | \$14,850.00    |                 |
| Lattice ordered<br>algebras and<br>applications                | Nov. 3, 2003          | NSF-Advance<br>Travel                                   | \$2,500.00     |                 |
| Lat. Expansions:<br>Duality, Canonicity,<br>and Correspondence | Nov. 1, 2003          | ARCC  | unknown        |                 |
| AWM workshop<br>panel participation                            | December 2003         | NSF-Advance<br>Travel                                   | \$2,500.00     |                 |
| Appl. of Topology<br>and Univ. Alg. to<br>Modal Logic          | Fall 2002             | U.S. Civilian Research<br>and Development<br>Foundation | \$7,000.00     |                 |

## TIZIANA GIORGI

| <b>Title/Co-PI's</b>   | <b>Date Submitted</b> | <b>Agency</b>                                 | <b>Amount</b> | <b>Duration</b>       |
|--|-----------------------|---|---------------|-----------------------|
| Nonlinear Partial Differential Equations with Applications to Finance and Physics<br>PI: M. C. Mariani<br>Co-PIs: T. Giorgi, R. G Smits<br>O. Mendez | Nov. 3, 2003          | NSF   | ~\$700,000    | 3 years               |
| Surface Nucleation in Superconductors Surrounded by Normal Materials   | Oct. 28, 2003         | NSF/Advance Inst Tra                          | \$9,347       | 1 year                |
| Workshop Travel Grant  | August 2003           | Fields Institute-Toronto                      | \$853.67      | 1 week                |
| New Mexico Analysis Seminar<br>PI: M. C. Pereyra<br>Co-PIs: T. Giorgi, J. D. Lakey<br>A. Sikora, R. Smits  | July 31, 2003         | NSF   | \$29,946      | 3 years               |
| Visiting Professors Program (Programma Professori Visitatori)  | March 10, 2003        | INDAM - Istituto Nazionale di Alta Matematica | 1500 Euros    | 1 month Summer Salary |

## JOHN HARDING

| <b>Title/Co-PIs</b>  | <b>Date Submitted</b> | <b>Agency</b>                        | <b>Amount</b> | <b>Duration</b>                        | <b>Status</b> |
|--|-----------------------|--------------------------------------|---------------|--|---------------|
| Applications of Topology and Universal Algebra to Modal Logic<br>Co-PIs: Bezhanishvili, Gehrke, Morandi (NMSU) | May 2003              | GRDF/CRDF                            | \$35,000      | 2 years                                | Funded        |
| Philosophical logic meets mathematical logic: from classical to quantum<br>Co-PI Smets (VUB)                   | July 2003             | Flemish Fund for Scientific Research | 4000 Euros    | Funds for a conference, Feb. 4-7, 2004 | Funded        |
| Completions and Orthomodular Structures  | October 2003          | NSF                                  | \$127,446     | 3 years                                | Pending       |

**MARTIN KRUPA**

| <b>Title/Co-PI's</b>                                | <b>Date Submitted</b> | <b>Agency</b>                      | <b>Amount</b> | <b>Duration</b> | <b>Status</b> |
|---|-----------------------|------------------------------------|---------------|-----------------|---------------|
| Dynamical phenomena due to the presense of canards. | November 2003.        | NSF program on Applied Mathematics | USD 200,000.  | 3 years         | Funded        |

## JOSEPH LAKEY

| Title/Co-PI's                       | Date Submitted | Agency | Amount    | Duration | Status  |
|-------------------------------------|----------------|--------|-----------|----------|---------|
| New Mexico Analysis Seminar         | July 2003      | NSF    | \$29,946  | 3 years  | pending |
| On models for coordination activity | April 2002     | ARO    | \$208,704 | 3 years  | current |

## JERRY LODDER

| Title/Co-PI's   | Date Submitted | Agency | Amount       | Duration | Status |
|---|----------------|--------|--------------|----------|--------|
| “Teaching Discrete Mathematics via Original Historical Sources” Lodder, Leung, Bezhanishvili, Pengelley, Ranjan | June, 2002     | NSF    | \$ 74,432.00 | 2 years  | fun    |

## MARIA MARIANI

| Title/Co-PI's   | Date Submitted | Agency   | Amount    | Duration    |
|---|----------------|--|-----------|-------------|
| Functional Analytic and Topological Methods in linear and non-linear Partial Differential Equations: Solvability and Regularity I am the PI | October 2003   | NSF Analysis program                               | \$705,159 | three years |
| Resolution of nonlinear problems I with applications I am the co-P  |                | X 202 Grant of the University of Buenos Aires      | \$25,000  | 2000-2003   |
| Resolution of nonlinear problems using numerical methods I am the PI Argentina - Chile cooperation  |                | University of Buenos Aires - Valparaiso University | \$2,500   | 2002-2003   |
| NSF ADVANCE   |                | NSF  |           | 2003-2004   |

- I am going to submit a grant proposal to the Applied Mathematics program of the NSF next week.

**PATRICK MORANDI**

| <b>Title/Co-PI's</b>  | <b>Date Submitted</b> | <b>Agency</b> | <b>Amount</b> | <b>Duration</b> | <b>Stat</b> |
|---|-----------------------|---------------|---------------|-----------------|-------------|
| Georgian-U.S. Bilateral Grants Program/Gehrke, Bezhanishvili, Harding | May 2002              | GRDF/CRDF     | \$35,000      | 2 years         | funde       |
| Title V - Developing Hispanic Serving Institutions Program            | March 1999            | Dept. of Ed.  | \$2,500,000   | 5 years         | funde       |

## HUNG NGUYEN

| Title/Co-PI's   | Date Submitted | Agency | Amount | Duration | Status                                 |
|---|----------------|--------|--------|----------|--|
| NSF International Programs on RESEARCH EXPERIENCE for The proposal was solicited by NSF through the main P. I., Professor Richard Alo of the University of Houston-Downtown   |                | NSF    |        |          | It is expected to get funding from NSF |
| Another solicited Research Proposal with SPAWAR Systems Center (NAVY/ONR) in San Diego: Efforts are underway to respond to a solicitation from SPAWAR , via a Research Grant proposal for 03-05 given that I am a summer faculty for this ONR programs. |                |        |        |          |  |

## BRUCE OLBERDING

| Title/Co-PI's                   | Date Submitted | Agency                      | Amount  | Duration | Status                     |
|---------------------------------|----------------|-----------------------------|---------|----------|----------------------------|
| Prüfer rings in function fields | Fall 2003      | NSA                         | 45,000  |          | funded but not yet awarded |
| Prüfer rings in function fields | Fall 2002      | NSF                         | 190,000 |          | not funded                 |
| Collaborative Research          | Fall 2002      | Minigrant                   | 1,110   |          | funded                     |
| Summer Research Award           | Spring 2003    | Mathematical Sciences, NMSU | 5,000   |          | funded                     |

## DAVID PENDELLEY

| <b>Title/Co-PI's</b>   | <b>Date Submitted</b> | <b>Agency</b> | <b>Amount</b> | <b>Duration</b>   |
|--|-----------------------|---------------|---------------|-------------------|
| Teaching Discrete Mathematics<br>via Original Historical Sources<br>PIs: G. Lodder, G. Bezhanishvili,<br>D. Pengelley, H. Leung, D. Ranjan | June 6, 2002          | NSF           | \$74,432      | 06/01/03–05/31/05 |

**SUSANA SALAMANCA-RIBA**

| <b>Title/Co-PI's</b>                                     | <b>Date Submitted</b> | <b>Agency</b>   | <b>Amount</b>     | <b>Duration</b>      | <b>Status</b>   |
|--|-----------------------|---|-------------------|----------------------|-----------------|
| Unitary dual of real groups                              | 10/03/01              | National Science Foundation                                   | \$ 87,002.00      | 06/01/02 to 05/31/05 | Granted 05/2002 |
| ADVANCE Institutional Transf. Award                      | 03/11/02              | National Science Foundation                                   | \$ 23,214.00      | 06/01/02 to 12/31/02 | Granted 04/02   |
| Sloan Minority Ph. D. program in Mathematical Sciences * | 08/25/00              | Alfred P. Sloan Foundation                                    | per Sloan formula | Indefinite           | Granted 12/1999 |
| Atlas Lie Groups Representations Focus Res. Grant        | 9/17/03               | American Institute of Mathematics/National Science Foundation |                   |                      | Pending         |
| Profess'l. Devel. and Outreach                           | Deadline: 01/01/04    | Institute for Advanced Study/Park City Mathematics Institute  | \$20,000.00       |                      | In progress     |

**ADAM SIKORA**

| <b>Title/Co-PI's</b>   | <b>Date Submitted</b> | <b>Agency</b> | <b>Amount</b> | <b>Duration</b> | <b>Status</b> |
|--|-----------------------|---------------|---------------|-----------------|---------------|
| Method of wave equation, Phragmen Lindelöf method and spectral properties of differential operators. | 9th of Oct. 2003      | NSF           | 156,000       |                 | Pending       |
| Summer Research Awards   | 1st of May 2003       | NMSU          | 5,000         |                 | Completed     |
| New Mexico Analysis Seminars   | 31st of July 2003     | NSF           | 30,000        |                 | Pending       |

**ROBERT SMITS**

| <b>Title/Co-PI's</b>   | <b>Date Submitted</b> | <b>Agency</b>                     | <b>Amount</b> | <b>Duration</b> |
|--|-----------------------|-----------------------------------|---------------|-----------------|
| Visiting Scholar   | February 2003         | Italian Government                | 1500 Euros    | 1 month         |
| Intereste Rate Models  | September 2003        | Arts and Sciences Research Center | 1200          | 1 month         |
| New Mexico Analysis Seminar<br>C. Pereyra PI, J. Lakey, T. Giorgi,<br>A. Sikora, R. Smits Co-PIs     | August 2003           | NSF                               | 20000         | 3 years         |
| Singular Stochastic Differential<br>Equations, Conditioned<br>Diffusions and Interest Rate<br>Models | September 2003        | NSF                               | 25,367        | 2 years         |
| Nonlinear PDE's T. Giorgi and<br>M. C. Mariani PIs, O. Mendez<br>and R. Smits Co-PIs                 | October 2003          | NSF                               | 749,250       | 3 years         |
| Heat Kernels, Conditioned<br>Diffusions and Interest Rate  | November 2003         | NSF                               | 175,306       | 3 years         |

**ROSS STAFFELDT**

| <b>Title/Co-PI's</b> | <b>Date Submitted</b> | <b>Agency</b> | <b>Amount</b> | <b>Duration</b> | <b>Status</b> |
|----------------------|-----------------------|---------------|---------------|-----------------|---------------|
|----------------------|-----------------------|---------------|---------------|-----------------|---------------|

**IRENA SWANSON**

| <b>Title/Co-PI's</b>   | <b>Date Submitted</b> | <b>Agency</b>                         | <b>Amount</b> | <b>Duration</b> |
|--|-----------------------|---------------------------------------|---------------|-----------------|
| Decompositions of ideals   | October 2001          | NSF                                   | \$97,263      |                 |
| Us-India Workshop: Commutative Algebra, Algebraic Geometry and Combinatorics, Bangalore, India<br>December 2003<br>PI: Herma Srinivasan<br>CO-PIs: Diane Maclagan<br>Rekha Thomas, Irena Swanson | April 2003            | NSF                                   | \$30,000      |                 |
| REU site: Computational Algebra Summer Institute at Colorado College. PI: Michael Siddoway<br>CO-PI: Irena Swanson   | September 2003        | DMS<br>infra-<br>structure<br>program | \$265,880     |                 |

### **CAROLINE SWEEZY**

| <b>Title/Co-PI's</b>                                | <b>Date Submitted</b> | <b>Agency</b>    | <b>Amount</b>                            | <b>Duration</b> |
|---|-----------------------|------------------|--|-----------------|
| Sloan Minority<br>PhD Fellowships<br>in Mathematics | August 2000           | Sloan Foundation | 2 or more students<br>@ \$25,400/student |                 |