

The Department of Mathematics

University of Colorado at Colorado Springs

A Self-study for the Academic Program Review AY 2005-2006

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Summary of the Self-study

1. The Mathematics Department is the largest department on the UCCS campus in terms of the number of students enrolled in its courses per year.
2. The Mathematics Department offers the B.S. and B.A. in mathematics, an M.S. in Applied Mathematics, a Master of Sciences with a mathematics option and a PhD in engineering with a mathematics option.
3. Faculty size:
 - Tenured or tenure-track full time: 9
 - Tenured or tenure-track half-time: 2
 - Half-time instructors: 2
 - Lecturers: 10 (Fall 2005)
12 (Spring 2006)
 - Graduate Teaching Fellows: 5
4. Both the Bachelors and the Masters programs in mathematics are strong, pedagogically sound, well-structured and comparable to those available in any major university throughout the country.
5. The Mathematics Department offers a number of service courses in support of diverse programs in the UCCS campus, such as engineering, computer science, business, education, biology, chemistry, physics and psychology.
6. There are four active centers of research in the Mathematics Department: algebra, applied analysis, harmonic analysis, and stochastic processes.
7. It is the only department on the UCCS campus that successfully runs research conferences and a visiting scholars program.
8. The Department has established a strong student retention program that is delivered through the Mathematics Learning Center, the Student Supplementary Instruction program, and the Placement Examination Program.
9. The Department successfully integrates the use of technology in its curriculum to enrich the learning process.

Summary of Recommendations (A Non-prioritized List)

1. Increase enrollment and graduates in the degree programs supported by the mathematics department.
2. Sharpen the focus which technology is integrated within the mathematics curriculum.
3. Improve the research resources of the Department.
4. Reduce the extent of the Department's reliance on honoraria instructors. This was already recommended in the 1998/1999 review. The situation has not improved since then. In the contrary, there are no current plans to replace two faculty that will retire in 2008.
5. Increase the number and the amount of research and instructional grants.
6. Expand the technology offerings and programs of the Department.
7. Develop a quantitative literacy program.

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I. PROGRAM/UNIT HISTORY

The Department of Mathematics was last reviewed during the Academic Year 1998-1999. Since then a lot has happened.

Two long time instructors (Nancy Baggs and Sandra Hilt) and an Associate Professor (Laurel Rogers) have since retired. Professor Kenneth Rebman who first came to this campus as the Vice Chancellor for Academic Affairs also taught for our Department. Unfortunately, sickness made him retire in 2002 and he died in 2003. Professor Haefner (Dean of the Engineering College) and Professor Henderson (Vice-Chancellor for Student Success) are formally part of our faculty. Professors Rangaswamy and Phillips signed a phased retirement agreement in 2004. They are both teaching half time until AY 2007/2008 at which time they will retire. On the bright side the Department has hired three Assistant Professors (Sarbarish Chakravarty, Radu Cascaval and Seung Son). Chakravarty has recently been promoted to Associate Professor. Here is the current distribution of the faculty per rank:

Half- time Instructor: Shannon Michaux
Assistant Professors: Radu Cascaval, Seung Son
Associate Professors: Sarbarish Chakravarty, Greg Morrow
Professors: Gene Abrams, Bob Carlson, Jim Daly, Keith Phillips, Kulumani Rangaswamy, Rinaldo Schinazi, and Yu Zhang

Moreover, the director of the Mathematics Learning Center, Shannon Schumann, also teaches half-time for this department.

We became a research department when Professor Rangaswamy was hired in 1983. He really deserves our gratitude for making the most of the limited resources that were allocated to him. He decided that research should be concentrated in only a few areas in order to increase the chance of collaboration between colleagues. We currently have four areas of expertise:

Algebra (Abrams, Rangaswamy, Son)
Differential Equations (Chakravarty, Carlson, Cascaval)
Harmonic Analysis (Daly and Phillips)
Stochastic Processes (Morrow, Schinazi and Zhang)

II. CURRENT STATUS OF PROGRAM (for past three years)

Follow up on the recommendations made by the 1999 reviewers

1. There has been no reduction on our dependence on honoraria as was recommended by the 1999 reviewers. In fact, there are no plans to replace two faculty who will retire in 2008. Hence, we are and will be even more dependent on honoraria than we have been in the past.

2. The graduate program after hitting a low in the early 2000's seems to have rebounded, enrollment wise. The recommendation of the reviewers to pay our graduate teaching fellows 15,000\$ was not implemented. They still get 10,000\$ to 11,000\$ although the tuition has risen quite a bit since the last review.
3. The library resources have improved to a satisfactory level since the last review thanks to the availability of electronic versions of scientific journals.
4. Salary compression has had some attention by the campus since the last review. However, the salaries in the department are still 5% to 10% lower than the mean salaries at Master granting Departments of Mathematics.
5. We continue to be quite active in distance learning activities. However, no infrastructure has been built since the last review and we still rely heavily on the enthusiasm of a few faculty and students to make our distance learning work.

Goals and objectives

The departmental degree programs authorized by the CCHE are: B.A. Mathematics, B.S. Mathematics, M.S. in Applied Mathematics, Master in Sciences with Mathematics Option, and a PhD in Engineering. In addition, the Department participates in the B.A. Distributive Studies program awarded through the College of Letters, Arts and Sciences.

The Department of Mathematics will leave the College of Engineering July 1, 2006, and as a result will no longer be participating (as one of the home departments) to the PhD in Engineering.

The Department of Mathematics strives for excellence in its teaching, research, and service missions. Such excellence is fundamental to ensure the success of students, staff and faculty. Towards those ends, the following goals for the Mathematics Department have been identified.

- a) To provide a strong, coherent curriculum for undergraduate and graduate majors in mathematics. The B.A. and B.S. in mathematics, the M.S. in Applied Mathematics, and the Masters in Science with mathematics option are designed to serve the needs of the students as well as the employers in industry and educational fields. These programs are revised periodically to maintain the highest possible standards and to enhance the mathematics education. Our M.S. program puts particular emphasis on topics that are relevant to the surrounding industries (statistics, differential and integral equations, and applied algebra).
- b) To provide in-depth service courses for engineering, computer science, physics, and other such diverse fields as business, biology, education and

economics. Students in business and the social sciences (as well as those in the natural sciences whose mathematical focus will be non-theoretical) need a basic understanding of the application of algebra and calculus to their fields, as well as operational skills within these areas. On the other hand, students majoring in mathematics, engineering, computer science, and the physical sciences must have a sturdy sequence of calculus courses that emphasize computation, application and an appreciation of theoretical development. The non-mathematics major will probably take a larger percentage of applied courses than the mathematics major. Computer science majors also need specific courses that apply to their area such as discrete mathematics, linear algebra, graph theory, probability and statistics and abstract algebra.

c) To become an active and robust center of research in selected areas of mathematics. As a small department with limited resources, our objective is not to reach across-the-board excellence in every branch of mathematics, but rather in such selected areas of mathematics that are either relevant to local industries or are outgrowths of existing natural strengths of the department. Past hirings have reflected our philosophy to strive for excellence in just a few areas of research mathematics. Specifically, we currently maintain, and continue to support the growth of excellence in areas of applied analysis, probability theory and algebra. This is completely in line with the high quality research goals of the UCCS campus.

d) To provide quality teaching in each course that is offered by the Mathematics Department. The Department has numerous faculty who have achieved teaching awards from the College, the CU-Colorado Springs campus, and the CU system. An active mentoring program, spearheaded by a teaching seminar (MATTER) for faculty members, has been established by the Department to foster quality teaching.

e) To maximize student success. The Department offers a wide variety of services, in particular, the Mathematics Learning Center and the Supplemental Instruction program, which are designed to maximize student success.

f) To implement innovative methods in the teaching of mathematics. Innovative teaching methods are to be encouraged in order to prepare students to succeed in our rapidly changing world. The Mathematics Department advocates and implements this goal through the Supplemental Instruction Program, group learning, and the use of technology throughout its curriculum. The Department has distinguished itself with an innovative use of the internet for distance learning.

g) To establish strong connections between the Mathematics Department and regional educational institutions. Through the coordinated grant activities of the Mathematics Department, the CU-Colorado Springs College of Education, and secondary mathematics teachers from the Pikes Peak area, the Department of Mathematics seeks to smooth the transition for students shifting from high school to college. The Department continues to reach out to other educational institutions in the area not only as a community service but also to meet the goals of the campus.

2. Teaching

The Department of Mathematics offers approximately 48 courses during each of the fall and spring semesters, and supports a full slate of nearly a dozen core courses during the summer semester. In all, over 2,600 students enroll in mathematics courses throughout an academic year. The Department provides not only a sound curriculum for its nearly 80 mathematics majors, but also offers many in-depth service courses for students in various science, engineering, and business-related disciplines.

The Department offers the B.A. and B.S. in Mathematics, a M.S. in Applied Mathematics, and a Master in Sciences with Mathematics Option. Enrollment in these degree programs has been healthy and stable as the table below indicates:

Year	B.S.	B.A.	M.S. Applied Math	M.S. with Math Option
Fall 2002/Spg 03	31/32	46/48	16/14	1/0
Fall 2003/Spg 04	32/29	53/43	14/17	1/0
Fall 2004/Spg 05	24/32	48/52	15/14	1/1

The Department supports a minor in mathematics (currently pursued by approximately 70 students) which is quite popular among science and engineering majors. Finally, two certificate programs are offered by the Department: the Certificate Program in Applications and Technology in Mathematics Education, and the Certificate Program in Industrial Mathematics.

The B.A. and B.S. Majors: The course offerings in mathematics are well-structured and are in line with the program objectives. The standard sequence for engineering, mathematics and physical science students consists of three calculus courses (Math 135, 136, and 235; each 4 credit hours) together with differential equations (Math 340; 3 credit hours) and linear algebra (Math 313, 3 credit hours). The other required courses (each is 3 credit hours) for a mathematics major are Discrete Math (Math 215), Probability Theory (Math 381) or Statistics (Math 310), Modern Algebra I (Math 414), Modern Analysis (Math 431) and Mathematical Modeling (Math 448). In addition, we offer a number of electives such as Number Theory (Math 311), Estimation, Convergence and Approximation (Math 341), Graph Theory (Math 350), Topics in Combinatorial Analysis (Math 351), Linear Algebra I (Math 413), Modern Algebra II (Math 415), Higher Geometry (Math 421), Fractal Geometry (Math 423), Introduction to Chaotic Dynamical Systems (Math 425), Modern Analysis II (Math 432), Optimization (Math 442), Ordinary Differential Equations (Math 443), Complex Variables (Math 445), Methods of Applied Mathematics (Math 447), Numerical Analysis (Math 465), Scientific Computation (Math 467), Mathematical Statistics I & II (Math 481 & 482), Linear Statistical Models (Math 483), and Stochastic Modeling (Math 485). The B.S. and B.A. in mathematics require 42 hours of mathematics courses. Students are encouraged to take two semesters of analysis (341 is strongly encouraged and 431 is required) and are required to take one semester of abstract algebra (414) and one semester of Mathematical Modeling (448). Hence, in both number and content, the required courses for our B.A. or

B.S. are generally as least as high as those for comparable degrees at other institutions.

The M.S. degree in Applied Mathematics: The M.S. degree in Applied Mathematics offers the student an opportunity to study specific areas of applied mathematics including statistics, probability, differential equations, applied analysis, computer vision, algebra and coding theory. All students take comprehensive exams in analysis and linear algebra. Students are required to make an oral presentation regarding some aspect of advanced mathematics. The graduate-level courses are described in the UCCS course catalog.

The Master of Sciences Degree with a Mathematics Option: The Masters of Sciences degree with a mathematics option offers the student the opportunity to pursue a mathematics option that is coordinated through the Department. In addition to a minimum of 15 credit hours of mathematics, students are required to take a number of courses from a science discipline other than mathematics and design a program that interweaves these two academic areas. Both a thesis option and a “culminating paper” option are offered.

Student Support: Courses taught in the Department are supported in a number of ways. First, the Mathematics Learning Center offers drop-in tutoring service to all students enrolled in junior-level or lower mathematics courses. The MLC is staffed by graduate students enrolled in the M.S. Applied Mathematics program and by mathematically competent undergraduate students. Second, group tutoring is offered in the housing village. In 2004/2005 there were about 9,000 visits per year in the MLC and Housing Village. Third, a number of the Department’s lower division courses are supported by the Supplemental Instruction Program. The S.I. Program was instituted in Spring 1996 to take advantage of the positive effects of group collaborative work among mathematics students. The program works as follows. Students (typically junior or senior math or science majors) are designated as the S.I. Leader for a given course. This leader organizes supplemental instruction sessions (typically two sessions per week for at least one hour per session). The leader is charged with engendering discussion amongst the students in response to questions that any student might ask. Students have responded to such sessions quite enthusiastically as borne out by the end of semester surveys. In addition, the S.I. leaders gain hands-on experience with the pedagogical process, experience which will be valuable for B.A. mathematics majors, a majority of whom will pursue careers in teaching.

Retention strategies: A major concern of this department is to increase retention of students. Mathematics courses are a major hurdle for many students. For instance, about 40% of students fail or withdraw from Calculus I and II. Gene Abrams (one of our award winning teachers) has taught Calculus I for the last several years in order to devise strategies to lower the failure rate. One of his conclusions is that many students start calculus without the adequate background in algebra. Hence, since 2005, every calculus instructor starts the course with an

algebra review followed by an algebra test at the end of the second week of class. Students who fail the test are encouraged to drop the class and enroll in College Algebra. We also send letters to all failing students (in all courses 215 and below) to warn them that they are failing and to seek help (we mention their instructor's office hours, the Mathematics Learning Center, the Supplemental Instruction program). To better prepare students before they start calculus, Shannon Michaux recorded mini-lectures to be posted online covering the topics students need for Business Calc, Calc 1 and Calc 2. There are 13 lectures posted on the web page. <http://eas.uccs.edu/MA/refresher/index.php>. Finally, we are closely working with Barbara Gaddis from the Student Success center to improve our retention rate.

CU Succeed: This is a partnership between the Math Department at the University of Colorado at Colorado Springs and Colorado high schools to provide college credit for select high school mathematics courses. We identify high school teachers who are qualified to serve as honoraria for our department and who agree to teach their courses in accordance with the University's standards. The courses are established in our system and taught in the high schools. Students enrolled in one of these courses have the opportunity to earn college credit for successful completion of the course. We currently are offering CU Succeed courses for Precalculus, Calculus 1 and Calculus 2. For more information, please visit <http://eas.uccs.edu/MA/CUSucceed/index.php>

Technology in the classroom: Many of the Department's undergraduate courses support curricula which requires students to use mathematical software such as Maple and Matlab in order to complete homework, long-term projects, and various group assignments. The Math 448/548 – Mathematical Modeling course, a capstone course for all math majors, is a case in point. It provides students hands-on learning experience about the use of Computer Algebra Systems (such as Matlab and Maple) in solving mathematical and real world problems. In class presentations and frequent computer lab visits help them get acquainted with the specifics of the software. Extensive homework exercises test their freshly acquired skills

Here are a few sample topics where computers are put to work in the Modeling course:

- Optimization (finding optimal values) for functions of many variables
- Linear Programming problems (simplex method)
- Simulation of Dynamical Systems (phase portrait analysis)
- Optimal Control problems (Pontryagin Maximum Principle)
- Markov Chains (theory and simulations)

MathOnline: This is a program that delivers some of our standard courses (e.g. calculus, differential equations, linear algebra) through the internet. The instructor delivers what is essentially a 'standard' lecture, but uses a computer, graphics tablet, and wireless microphone, which allows the lectures to be broadcast synchronously via the internet. Lectures are also archived for later student review;

the in-class students utilize this aspect of the course on a regular basis. Several of our faculty have invested considerable time and energy to develop this program. The delivery method allows for off-campus students to take the course at a distance. Hundreds of high school students throughout the country have done so, as well as active military men and women stationed throughout the world. Every academic year we offer the three Calculus courses, differential equations, linear algebra, number theory, and discrete math. The recorded lectures have even been used by students whose university had been disabled by Hurricane Katrina in Fall 2005.

Minors in Mathematics and Statistics: In 1994, the Mathematics Department instituted a minor in mathematics and a minor in statistics. The minor in mathematics requires 24 hours of courses given by the Department with at least nine of those hours numbered above 302. The minor in statistics is similar requiring 21 hours in approved math courses given by the Department. In both such minors, the student is required to obtain the approval of a department advisor.

Service Courses: Virtually all departments on campus require the mastery of the content from precalculus courses such as Math 104 (College Algebra) and Math 105 (Elementary Functions of Calculus). Math 111 (Topics in Linear Algebra) and Math 112 (Calculus for Business and Economics) serve the needs of the College of Business. The calculus sequence (Math 135, 136, and 235) is required of a number of majors across campus such as electrical engineering and physics. Math 215 (Discrete Mathematics) is a required course of computer science majors. Math 301 and 302 (Mathematics for Elementary Teachers I & II) serves the needs of the College of Education. Other examples of service courses taught by the Mathematics Department abound.

Certificate Program: The Department of Mathematics now offers two certificate programs: the Industrial Mathematics Certificate and the Applications and Technology in Mathematics Education Certificate. The Industrial Mathematics program prepares students for careers in the applications of mathematics to industry by emphasizing mathematical modeling, traditional applied mathematics and work on actual industrial problems with the cooperation of representatives from industry. The flagship course of this program is Mathematical Modeling (Math 448/548). The Applications and Technology in Mathematics Education program trains current and future mathematics teachers in the use and methodology of applications and technology in the mathematics classroom. The flagship course of this latter program is Technology in Mathematics Teaching and Curriculum (Math 410/510).

Student Advising: The Mathematics Department requires each mathematics major to meet with a faculty advisor in each spring semester. Graduate students are required to meet with a faculty advisor in each fall semester. Students opting

for the thesis option of the M.S. degree work with their advisor throughout their second year of studies.

Teaching/Curriculum Development: Since the last Department of Mathematics Review in 1999, several new courses and programs have been developed. Our faculty is always ready to put time and energy to try new courses and new ways of teaching. For instance, Bob Carlson has developed a course to bridge the gap between Calculus and the required Analysis course. Most math majors now take this intermediate course and it has helped make the analysis course less traumatic. Moreover, Bob has written a book, soon to be published, on the subject. Rinaldo Schinazi has written a book (published in 2001) for a semester course on probability and statistics. Of course, not all experiments succeed. We have instituted a senior seminar required for all math majors in 2002. But we recently decided to eliminate this course. A majority of the faculty felt that the increased teaching load for the faculty was not justified by the somewhat mixed results of the students. It was, nevertheless, a worthwhile experiment.

Teaching Data Summary: As a rule, Mathematics Department faculty teach five courses per academic year.

For its undergraduate courses, the Mathematics Department supports a student-to-faculty ratio of 19 per instructor and 24 per tenure track faculty.

Specific data concerning Student Credit Hours (SCH) and Full-time Equivalents (FTE) is compiled in Appendix III.

Awards: The Mathematics Departments has been blessed with several talented teachers who have been awarded for their efforts from the College of Engineering and Applied Science, the CU-Colorado Springs campus, and the CU system.

3. Research/Creative Work

During the last three years, all of the full-time faculty of the Mathematics Department were actively engaged in various research activities. As a group, the faculty were very productive with articles accepted in top rated journals. Ten of our faculty published at least one article in an international journal in the last three years (several faculty have published several articles per year in the last three years). Moreover, two (Chakravarty and Zhang) of our faculty currently hold National Science Foundation grants and one (Schinazi) holds a National Security Agency grant.

4. University/Community Service

The entire mathematics faculty made, in various ways, significant service contributions to the University and community. It is important to note that these contributions extend far beyond mere committee membership. For example, for the last three years, a number of faculty across the disciplines of mathematics and science have been meeting to increase our involvement in mathematics and

science education in public schools. In particular, Jim Daly has been a part of a number of projects: he taught workshops sponsored by Colorado Commission of Higher Education Grant in Statistics education for middle school math teachers, high school math teachers, and university statistics instructors that teach education majors. Jim was also the grant coordinator of the Pikes Peak Regional Initiative in Science and Math - 3 year, \$800,000 grant for improving the content knowledge of non-highly qualified middle and secondary math and science teachers. Jim was also the principal investigator of an NSF proposal for fellowships to put math, science, and engineering graduate students into the secondary classroom. The grant was not funded (1.2 million) but will be resubmitted.

In another direction, Gene Abrams visits local high schools to convince their students to take more high level mathematics courses. He has also started the CU-Succeed program which allows HS students to get CU credit for precalculus and calculus courses.

5. Available Resources

FACULTY FTE:

<u>Year</u>	<u>FTE</u>
2002/03	11.5
2003/04	11.5
2004/05	11.5

All full-time faculty hold Ph.D. degrees and the honoraria faculty (with the exception of our Graduate Teaching Fellows) hold at least master's degrees with some having Ph.D.'s. Most of the full-time faculty are known nationally and internationally for their research.

AVERAGE 9-MONTH SALARY BY RANK:

Professor	\$72,741
Associate Professor	\$58,140
Assistant Professor	\$49,325

BUDGET

The 2004-05 budget for the Mathematics Department (apart from faculty salaries) is given below:

<u>Category</u>	<u>Budget</u>
Honoraria Salary	\$102,391
Student Hourly	\$ 720
Graduate Teaching Fellows	\$ 15,850
Operating Expense	\$ 22,984
Mathematics Colloquia	\$ 4028
Supplementary Instruction Program	\$ 12,191
Travel	\$ 11,481

Equipment Maintenance	\$ 5199
Visiting Scholars Program	\$ 3500

6. Diversity

The Department of Mathematics is committed to helping each person realize their full potential in mathematics education. The Department believes that in order to achieve equal opportunity for all, an important curricular goal must be to provide individuals with role models, tutoring, and peer group support, in an environment sensitive to diverse reactions to teaching and learning styles.

A review of the math faculty during the last ten years indicates that there has been a significant multi-cultural, ethnic and gender diversity in both its regular and honoraria faculty. Currently, the CU-Colorado Springs Mathematics Department has two Asian-American, two East Indian, one Brazilian (among other things), and two half time female instructors. The current makeup of mathematics honoraria is seven males and five females; and of the graduate teaching fellows is three males and two females.

This Department has made unsuccessful offers to several female candidates to tenure-track positions in the recent past. It will keep trying.

III. STUDENT OUTCOME ASSESSMENT

There are three major stakeholders involved in the earning of an undergraduate degree in mathematics: the students, the faculty, and potential employers of such students.

The assessment program of the mathematics Department is designed to measure the extent to which students are achieving the four Intended Student Outcomes listed below. Students must have a firm grasp of each of these outcomes before they are considered to be competent in mathematics at the bachelor's level. Faculty must have appropriate vehicles by which they can determine the effectiveness of various educational and pedagogical techniques, in order to improve the learning process. Potential employers (most commonly in the education or high technology industries) need employees who are skilled in the four indicated outcomes.

The Intended Student Outcomes

1. *Students will be able to analyze problems and formulate appropriate mathematical models.*
2. *Student will understand mathematical techniques and how they apply.*
3. *Students will recognize phenomena and be able to abstract, generalize, and specialize these patterns in order to analyze them mathematically.*
4. *Students will be able to express themselves in writing and orally in an articulate, sound, and well-organized fashion.*

Assessment Tools. To determine the level of achievement of the outcomes, the Department utilizes the following types of assessment tools:

- a) Exams and homework in courses. Exams and homework are a standard part of all courses taught in the Department of Mathematics. Such instructional and evaluative activity continues unabated. Full time faculty grade all exams. No exams are multiple choice nor are computer graded. Homework graders are provided to all full time faculty in courses numbered 300 and below. All instructors are expected to assign homework.
- b) A summary of student performances in the “capstone” courses, Math 431 (analysis) and Math 448 (mathematical modeling). The instructors of Math 431 and Math 448 submit reports to the faculty of the Mathematics Department. These reports include course documents and summarize student performances as indicated by in-class exams. In addition, the instructors provide a general assessment of the skills of the students as a group. The faculty responds with critiques, comments and suggestions for possible changes in the following semesters.
- c) Monthly department meetings to discuss curricular and pedagogical issues. The Department found this idea so attractive that it instituted the Mathematics Teaching Roundtable (MATTER). This is a series of discussions among mathematics teachers regarding various pedagogical and educational matters of concern to all of us.

IV. PROGRAM/UNIT PLANNING

We believe that the Department of Mathematics succeeds in its overall goal of striving for excellence.

Through its four degree programs and two certificate programs, the Department provides a strong curriculum for undergraduate and graduate majors and minors in mathematics. The Department succeeds in delivering service courses for virtually every department on the CU-Colorado Springs campus. The Department’s curriculum is delivered to the students with high caliber teaching, and these teaching activities have been recognized consistently with awards from the College, the campus and the entire CU system. Our innovative teaching methods have been recognized and rewarded by the CU-Colorado Springs campus and CU system.

The research activities of the Department have included the securing of numerous grants from both national as well as internal funding sources. We have established ourselves as excellent organizers of international mathematics conferences.

Finally, the Department of Mathematics has made strong connections with regional educational institutions, as well as with industrial and commercial sectors in Colorado Springs.

Despite these accomplishments, the Department strives to improve. To effects such improvement, we have identified the following non-prioritized ventures which we intend to pursue.

1. Increase enrollments and graduates in the degree programs supported by the Mathematics Department. In addition to aggressive recruitment and retention efforts, the Department intends to explore the development of tracks within the B.S. and B.A. degrees that are attractive to both students and potential employers. For instance, our actuarial science tract has attracted some promising interest.
2. Reduce the extent of the Department's reliance on honoraria instructors. At the very least, replace the retiring faculty with tenure track faculty. Currently, over 50% of the Department's student FTE is taught by honoraria instructors. Although the cadre of honorarium instructors is for the most part adequate, in order to ensure a consistent, excellent, committed teaching program, we feel that this reliance should be decreased.
3. Increase the number and the amount of research and instructional grants. Funding that will allow a faculty member release time to conceive and write proposals will be critical to the success of this goal.