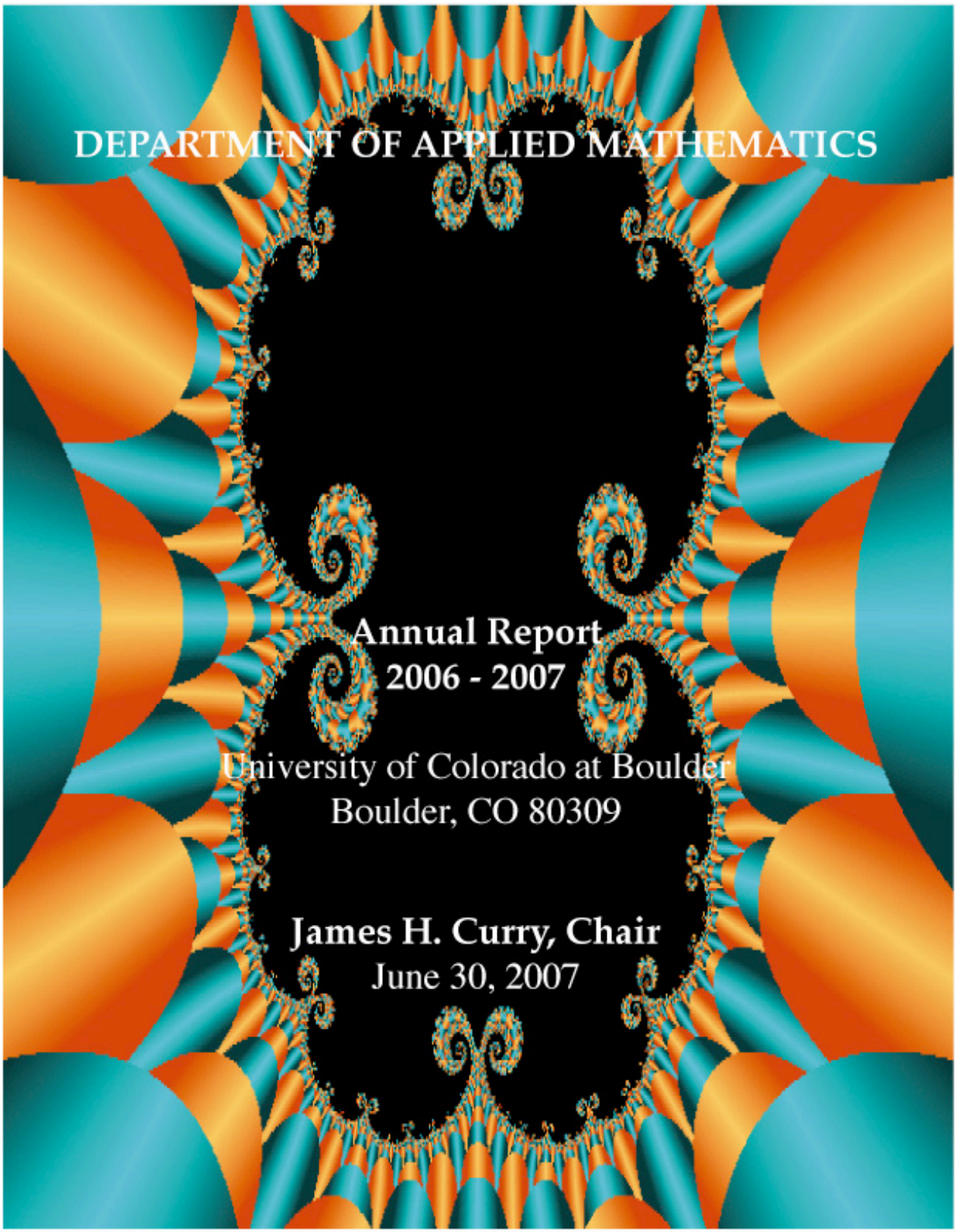


Colorado
University of Colorado at Boulder ™

Cover Art

This year's image was produced by Applied Math graduate student/PhD recipient, Cory Ahrens.

Each year, the Department of Applied Mathematics at the University of Colorado at Boulder creates a t-shirt that illustrates aspects of current research in the department. Cory Ahrens, an Applied Mathematics Ph.D. student working with Professors Mark Ablowitz and Silvana De Lillo (from the University of Perugia, Italy), designed this year's t-shirt. Cory's research focuses on nonlinear dispersive wave equations. The "Making Nonlinear Waves" t-shirt shows an artists rendering of a fractal. This fractal arose in the study of how to discretize a certain integrable nonlinear partial differential equation, namely the Eckhaus equation. Nonlinear partial differential equations are normally extremely difficult to solve analytically, but the Eckhaus equation, discovered in the 1980s, is solvable using special techniques and is hence termed integrable. Since the mid 1970s, the area of integrable nonlinear differential-difference equations (the discrete analog of nonlinear partial differential equations) has been a vibrant area of research, with applications in, to name a few, photonic waveguides (a way to guide light) and Bose-Einstein condensates (a subject of great interest at CU since Carl Wiemann and Eric Cornell won the Nobel prize in physics in 2001).

Department of Applied Mathematics

University of Colorado at Boulder

Vision

The vision of the Department of Applied Mathematics at the University of Colorado is to be an internationally leading department in Applied Mathematics in research and education.

Mission

The Department of Applied Mathematics at the University of Colorado strives to provide excellent teaching, research, and service to the university community and to the world in the application of mathematics to other disciplines.

Objectives

The Department of Applied Mathematics has four primary objectives:

- *to teach our students well;*
- *to seek out and develop new, interesting applications of mathematics in other disciplines;*
- *to provide each student with a rich educational experience; and*
- *to create new mathematics.*

We interpret this to mean:

- Provide undergraduate and graduate students with a high quality education and training in applied mathematics and prepare them for careers in industry, laboratories and the academic professions;
- Offer and monitor degree programs leading to BS, MS and PhD degrees in Applied Mathematics;
- Nourish and maintain a professional environment in which excellence in teaching, learning, scholarship and creativity are of central importance;
- Assure teaching and research expertise in a number of key areas of applied mathematics including the methodology of applied mathematics, computational mathematics and algorithms, industrial applications, applied probability and statistics.

Annual Report 2006

Table of Contents

Overview

Jim Curry - Chair

Anne Dougherty - Associate Chair

Departmental Activities

Undergraduate education in the Department of Applied Mathematics provides students with broad-based preparation for the challenges and opportunities of today and tomorrow. Through courses, projects, research and other educational activities, the Department provides unique experiences to our majors and minors. The Department also has a large teaching commitment since most undergraduate engineering majors are required to take four courses in applied mathematics. The Department taught a total of 3650 undergraduate and graduate students in 2005-2006. See 6 for a detailed list of the courses taught. We had 105 undergraduate majors in 2006-2007, an x# % increase over the previous year and a x% increase over the past two years. This is quite remarkable and we attribute it to an increasing appreciation among students for the value of applied mathematics. x# students received their

baccalaureate degrees this year, our largest class ever. (See 2D for a list of our graduates.) We are proud that x# students in the fall and x# in the spring semester made the Dean's List for academic achievement, with grade-point averages of 3.6 or better. Our minor program continues to remain steady, attracting students from other majors who are interested in more in-depth training in applied mathematics. x# students have declared an Applied Math minor, and even more are taking at least some of the upper division courses towards it. (This is a x#% increase over the previous year.)

The undergraduate student chapter of SIAM (the Society for Industrial and Applied Mathematics) is responsible for promoting interactions between applied math faculty and majors. It also sponsors activities and presentations that introduce undergraduates to the use of mathematics in engineering and the sciences. Events this past year included student presentations, invited speakers and the ever-popular mentor lunches. (For a complete list of presentations, please see 4G.)

The primary activity of the undergraduate SIAM chapter this year was the organization, together with the SIAM chapters of CU-Denver and CU-Colorado Springs, of the Front Range Applied Mathematics Student Research Conference. This conference was held on March 11, 2006. Professor David Donoho, from Stanford, was the keynote speaker. The conference had (45) attendees including (22) student speakers from (6) universities along the Front Range. Brad Klingenberg served as Chapter President and was assisted by Kris Tucker, Lauren Anderson, Rachel Danson, Kye Taylor, and Brandon Booth. The officers for the 2006-07 academic year will be ( ) (President), ( ). Anne Dougherty was the faculty advisor for 2005-06 and will continue in that capacity next year.

Undergraduate Education

The art of creating and testing mathematical models of real-world problems is an important part of our undergraduate training. Undergraduate students are given an opportunity to showcase their mathematical, computational and communication skills in the annual Mathematical Contest in Modeling, (MCM) an international contest sponsored by COMAP (The Consortium for Mathematics and its Applications). Students from all science, math and engineering majors are encouraged to enter. In 2006, the Applied Math Department entered five teams. The contest ran from 6:00 pm February 2, 2005 until 6:00 pm February 6, 2005 and drew entries from 748 teams from around the world. Over the past seven years, the Applied Math teams have done extremely well, receiving

an Outstanding designation seven times. This year, one team achieved an Outstanding, the highest possible designation. This designation was received by only 12 of the 748 teams! Our students continued success in the modeling contest is a tribute to their abilities and CUs strong academic programs. Advisors are Bengt Fornberg and Anne Dougherty.

Fifteen students from CU participated in the modeling contest this year. The MCM paper submitted by the team consisting of Brian Camley (Math and Physics double major), Pascal Getreuer (APPM BS-MS student), and Brad Klingenberg (APPM major) was Outstanding on Problem A. Problem A involved positioning and moving sprinker systems for irrigation. This Outstanding paper was also named the winner for BOTH the SIAM and MAA paper awards. To the best of our knowledge, this is the only team to win Outstanding for three consecutive years in the history of the contest.

Congratulations are also due to: 1) Ben Barrow (APPM and CSEN), Thomas Josephson (APPM and CSEN), and Laura Waterbury (APPM) who received a Meritorious on Problem A (top 16% of all papers submitted). 2) Michael Gurshtein (EPEN and APPM minor), Josh Destree (PHYS), and Edwin Eng (CSEN) who received a

Meritorious on Problem B. 3) Brandon Booth (APPM and SCEN), Rachel Danson (APPM), and Benjamin Safdi (EPEN) who received a Meritorious on problem C. 4) Christopher-Ian Davis (APPM), Ramsey Majzoub (EPEN), and Brennan Dayberry (ECEN) who received an Honorable Mention on problem A (25% of all papers submitted).

The VIGRE grant, from the National Science Foundation, has fundamentally changed the character of our undergraduate major. This past year, 9 of our more advanced undergraduates have participated in "tetrahedra", consisting of undergrads, grads, postdocs and faculty working together on a common research theme. See 2G for more information about VIGRE.

This year's class of graduating seniors was outstanding! Ashley Moore graduated summa cum laude (cumulative GPA must be at least 3.90); Nate Aragon, Vincent Ferreri, Pascal Getreuer, Paul Kolesniko , and Kolt Peightal graduated magna cum laude (cumulative GPA at least 3.8) and Matthew Martin, Ian Scholfeld and Daniel Washington graduated cum laude (cumulative GPA at least 3.7). Ashley Moore was recognized as the College of Engineering and Applied Sciences Outstanding Senior for Research Excellence and as the Departments Outstanding Senior for Academic Excellence. Pascal Getreuer was selected as the Departments Outstanding Senior for Research Excellence. Nate Balk, Rachel Danson, Brad Klingenberg and Kris Tucker received Henri-James Awards, a cash award given to outstanding Applied Math graduating seniors who are continuing on to graduate school.

Our students also received recognition from agencies outside of the university. Brad Klingenberg, received a Goldwater Scholarship for the 2006-2007 academic year.

The members of the Undergraduate Committee were Anne Dougherty, chair, Mark Ablowitz, James Meiss and Adam Norris. The duties of this committee are to advise and recruit undergraduates to the major and the minor, and to supervise all aspects of the undergraduate curriculum. Special thanks to the undergraduate committee and especially Anne Dougherty for her successful efforts in working with undergraduate students!

Graduate Education

The role of the graduate program is to give students in-depth training in applied mathematics and to provide the skills necessary for success in industry, government laboratories, or academia. Different departments around the country use different definitions of “applied mathematics”. In this department, the areas of mathematical expertise are: scientific computation, physical applied mathematics, dynamical systems, analysis, statistics/probability, and mathematical biology. In addition, the department maintains an active program of Affiliated Faculty. These are faculty members in other departments with an interest in applying mathematics within their own disciplines. (Currently, there are 46 Affiliated Faculty, see §3B.) A graduate student in APPM can pursue a doctorate in Applied Mathematics with an Affiliated Faculty member as the thesis advisor, along with an APPM co-advisor. In fact, 7 APPM graduate students are currently working under the supervision of Affiliated Faculty. A basic goal of this department is to seek out and develop new areas of application of mathematics, and our Affiliated Faculty members play a crucial role in that process.

Some of the demographics of the graduate program in the Applied Math Department:

- In 2005-2006, the department had 70 graduate students.
- In spring 2006, we welcomed one new graduate student to our program.
- We continue to attract a large fraction of U.S. citizens: in 2005-2006, 90\% of the incoming students with financial support were U.S. citizens.
- 16 of our graduate students are women.
- Our graduate program had two under-represented minority students in 2005-2006.
- 6 students completed their PhDs in 2005-2006. 15 students received MS degrees, with 9 continuing towards the PhD at CU. See §2D for a list of this year's graduates.
- Funding: Slightly less than half of our graduate students (32) were Teaching Assistants (TAs) in the fall semester (includes both full time and part time TAs) and 28 served as TAs in the spring.

The department offers three formal interdisciplinary programs, all at the MS level.

1. A Combined MA/MS with the Molecular, Cellular, and Developmental Biology Department (MCDB). The combined MA/MS is a three-year interdisciplinary program designed to produce students trained both in applied mathematics and in molecular biology. A student who completes this program can begin a career in the biological sciences with a very desirable combination of skills, or can continue on to a PhD either in APPM or in MCDB.

2. An MS with a Computational Science and Engineering Track. This track is designed for a student in a participating department in science or engineering, with a strong interest in scientific computation and mathematical analysis. Under this plan, the student obtains an MS in APPM on the way to a PhD in the other department. Six other departments now participate in this program.

3. Teacher-Licensure Option. An APPM graduate student can fulfill the outside-sequence requirement in the School of Education. By also meeting the requirements of that School, a student can obtain both an MS in applied mathematics and a license to teach mathematics in a secondary school (i.e., in middle through high school). More information about the graduate program is available at <http://amath.colorado.edu/programs/grad.html>

The Graduate Committee for 2005-2006 consisted of Jem Corcoran, Keith Julien, Tom Manteuffel (Chair) and Steve McCormick. The main business of the committee is to advise the current graduate students, recruit and admit students to the graduate program, and administer the preliminary exams. Special thanks to the graduate committee and especially Tom Manteuffel for his successful efforts in working with graduate students!

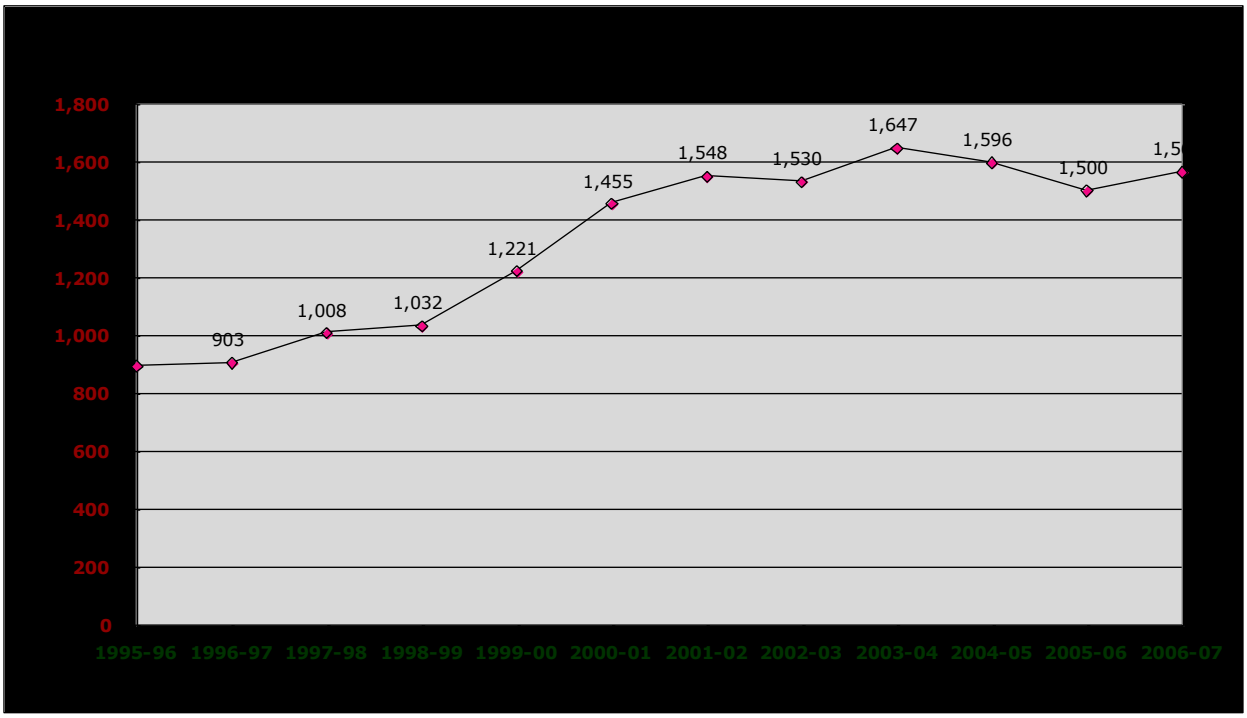
Enrollment Statistics

Enrollment in the courses offered by the Department continues at extremely high levels. It is particularly noteworthy, given the faculty's small size, that the Department teaches so many students. The statistics over the past fifteen years are as follows:

Year	Total Enrollment in courses	Number of Graduate Students	Number of Undergraduate Majors	Number of Undergraduate Minors
1991-92	2781	27	50	
1992-93	2797	28	47	
1993-94	2809	33	47	
1994-95	2670	39	51	
1995-96	2734	40	54	
1996-97	2973	46	52	
1997-98	3108/**3323***	51	44	
1998-99	3172/**3566***	49	54	
1999-00	3166/**3529***	50	60	21
2000-01	3091/**3517***	61	63	28
2001-02	3275/**3701***	63	66	40
2002-03	3417/**3878***	70**	69**	44**
2003-04	3414/**3978***	75**	97**	44**
2004-05	3187/**3664***	73**	108**	43**
2005-06	3650/**4118***	70**	105**	54**
2006-07	3900/**4381***	69**	129**	

*The totals in bold include all Calculus I & II Work Study Groups, as well as Calculus III Labs & Differential Equations Labs. Enrollment in our upper division courses has continued to increase. With projected increases in undergraduate enrollment we continue to foresee enrollment increases in applied mathematics courses.

**Number of unduplicated students.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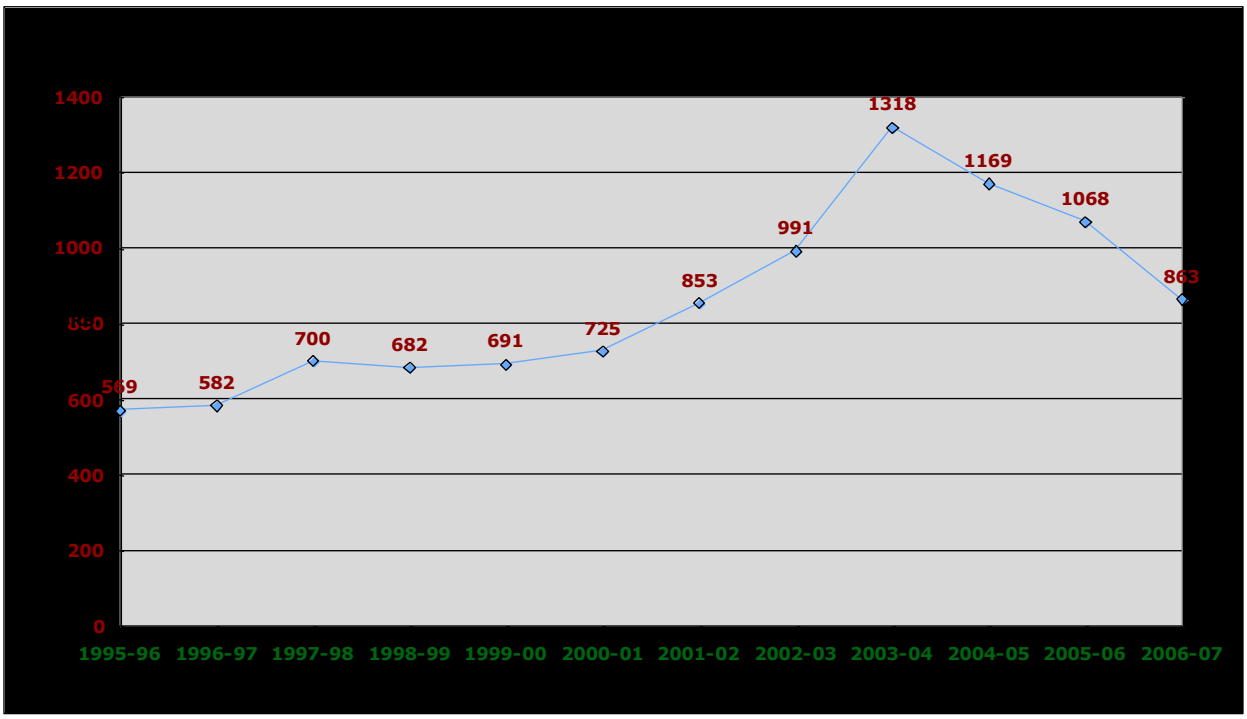
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2002-03
2003-04
2004-05
2005-06
2006-07

Graduates:

We congratulate our students who graduated in the last year with a degree in Applied Mathematics. they are:

PhD degree (See 7D for thesis titles and advisors)

December 2006	**May 2007**	**August 2007**
Hong Liu		Ji Sun Lim
		Jonathan Pietarila-Graham
		Thaned Rojsiraphisal
		Jian Wang
		Julia Zuev

Master's Degree

December 2006	**May 2007**	**August 2007**
Mark Allen	Jose Garcia	

Bachelors/Masters degree

December 2006	**May 2007**	**August 2007**
		Lauren Christine Anderson
		Rachel Anne Danson
		Laura Alexandra Waterbury

Bachelors degree

December 2006	**May 2007**	**August 2007**
		Erin Lanae Best
		Hsing-Ting Chen
		David Goluskin
		Jitendra Sameera Wijesinghe

Faculty Awards and Honors:

Research:

This has been a year of significant accomplishment in research both by the faculty and students in the Department. Two undergraduate students and one graduate student were awarded National Science Foundation Graduate Research Fellowships: Moorea Brega and Alejandro Cantanero, who will continue their graduate studies at UC Berkeley and UCLA respectively, and Maribeth Bleymaier, who will continue her graduate studies here at the University of Colorado-Boulder.

Not only did one faculty member receive a prestigious Sloan Foundation award (Meredith Betterton), but two faculty members received the Boulder campus Faculty Fellowships as an acknowledgment of outstanding performance in research. Both Keith Julien and Steve McCormick used their Fellowship time for international travel, to establish new research collaborations so that they can prepare students for the international stage. Congratulations to them.

Harvey Segur gave the University's Distinguish Research Lecture, part of the most prestigious series that the University has to offer (for more details see below). Congratulations to Harvey.

The year ended with an international conference recognizing career contributions of Professor Mark Ablowitz (for more details, see below). Congratulation to Mark!

In addition to the accomplishments highlighted above let me also note that the faculty in Applied Mathematics were fully engaged in research and report that they were principal investigator or co-principal investigator on 44 funded grants, produced 69 refereed journal articles or research/technical reports, and gave 60 colloquium or professional presentations. They were also dissertation advisors to 33 students and members of 40 dissertation committees. This summary is very impressive given our small faculty size.

Editorships:

An important aspect of the faculty's role in the national and international scholarly effort in applied mathematics is service as editors and advisory board members of archival journals and textbook series.

Conferences and Seminars:

Copper Mountain Conference, April 2 7, 2006 Tom Manteuffel and Steve McCormick organize the Copper Mountain Conference in the spring of each year. This year the conference was on Iterative Methods and was held during April 2 -April 7. There were 175 participants and 135 lectures. A special feature of this conference is the support of students, which usually amounts to free lodging and registration, and travel assistance in some cases. This year 55 students attended the conference. Student participation has made the Copper Mountain conferences a central contributor to the fields of multigrid and iterative methods.

Department-wide Grants:

Outreach:

Donor Activities:

Changes in Personnel:

FACULTY, INSTRUCTORS, RESEARCH ASSOCIATES, VISITORS, and STAFF

A Core Faculty, Instructors, and Research Associates

Cory Ahrens - *Research Associate*; PhD, University of Colorado at Boulder, nonlinear waves, fast computational algorithms, inverse problems.

Mark J. Ablowitz - *Professor*; PhD, Massachusetts Institute of Technology. Partial Differential Equations, Solitons, Nonlinear Waves.

Jerrold Bebernes - *Professor Emeritus*; PhD, University of Nebraska. Differential Equations, Reaction Diffusion Systems, Combustion Theory, Analysis.

Meredith Betterton - *Assistant Professor*; PhD, Harvard University. Mathematical Biology, Geophysical Modeling, Physical Mathematics. (transferred to Physics January, 2006).

Gregory Beylkin - *Professor*; PhD, New York University. Computational Methods, Wavelets, Geophysical Inverse Scattering.

Cathy Bishop - *Instructor (Spring, 2006)*; M.S., University of Colorado, Computer Science, Software Development and Training.

Marian Brezina - *Postdoctoral Research Associate*; PhD, University of Colorado at Denver. Multigrid Methods, Scalable Algorithms, Parallel Computing.

Jem Corcoran - *Associate Professor*; PhD, Colorado State University. Applied Stochastic Processes, Perfect Simulation, Statistical Physics.

James H. Curry - *Chair, Professor*; PhD, University of California at Berkeley. Dynamical Systems, Numerical Methods, Nonlinear Equations.

Andrew Docherty - *Lecturer*; PhD, University of New South Wales, Australia, Timing Shifts of Pulses in Long-Haul Optical Communications Systems with Strong Dispersion Management.

Anne Dougherty - *Associate Chair & Senior Instructor*; PhD; University of Wisconsin, Madison. Applied Probability, Stochastic Processes.

Robert Easton - *Professor Emeritus*; PhD, University of Wisconsin. Dynamical Systems, Hamiltonian Mechanics.

Bengt Fornberg - *Professor*; PhD, Uppsala University, Sweden. Numerical Analysis, Computations of Wave Phenomena.

Susan Hallowell - *Lecturer;* PhD, University of Pennsylvania, Transportation and Telecommunications Operations and Service Design, Network Optimization.

Berend Herbst - *Visiting Professor/Lecturer*; University of Stellenbosch, South Africa, Mathematical and Computational Analysis of Nonlinear Waves.

Keith Julien - *Associate Professor*; PhD, Cambridge University, U.K. Mathematical and Computational Fluid Dynamics, Dynamical Systems Theory.

Eunjung Lee - *Postdoctoral Research Associate*; PhD University of Colorado at Boulder.

Congming Li - *Associate Professor*; PhD, New York University. Elliptic Partial Differential Equations.

Manuel Lladser - *Assistant Professor;* PhD, The Ohio State University. Probability Theory and Applied Probability, Discrete Mathematics, Analysis of Algorithms and Bioinformatics.

Jefferey T. Luftig - *W. Edwards Deming Professor of Management*, Lockheed Martin Engineering Management Program, and Dept. of Applied Mathematics *Adjunct Professor*; PhD, University of Minnesota, Minneapolis/St. Paul. Applied Statistics, Business and Industrial Research, Statistical Methods in the Quality Sciences, Data Mining.

Thomas Manteuffel - *Professor*; PhD, University of Illinois, Urbana. Computational Math, Numerical Linear Algebra, Iterative Mathematics, Numerical Solution of PDE's, Parallel Computation, Computational Fluid Dynamics.

Per-Gunnar Martinsson - *Assistant Professor*; PhD, University of Texas at Austin. Numerical Analysis, Modeling of Heterogeneous Media, Computational Biochemistry.

Stephen McCormick - *Professor*; PhD, University of Southern California. Computational Math, Numerical Partial Differential Equations, Multigrid Methods, Parallel Computation, Computational Fluids, Tomography, Electromagnetics, Biomathematics.

James D. Meiss - *Professor*; PhD, University of California at Berkeley. Dynamical Systems, Hamiltonian Mechanics, Plasma Physics.

Lucas Monzon - *Postdoctoral Research Associate/Lecturer*; PhD, Yale University. Harmonic Analysis, Wavelets.

Paul Mullowney - *Lecturer*; PhD, University of Colorado at Boulder.

Philippe Naveau - *Adjunct Assistant Professor*; PhD, Colorado State University. Applied Probability and Statistics.

Mary Nelson - *Instructor;* PhD, University of Colorado at Boulder, Assessment.

J. Adam Norris - *Instructor*; PhD, University of Colorado, Boulder. Phase Change Kinetics, Perturbation Methods, Numerical Methods.

Fernando Perez - *Postdoctoral Research Associate*; PhD, University of Colorado at Boulder. Numerical field theory, Fast Numerical Algorithms.

John Prentice - *Lecturer*; PhD, University of New Mexico. Stochastic protein folding, Cardiac biophysics, Shock waves in condensed matter, Exploration geophysics, Entrepreneurship.

John Ruge - *Postdoctoral Research Associate*; PhD, Colorado State University. Algebraic Multigrid Methods.

Kristian Sandberg - *Postdoctoral Research Associate*; Ph.D., Dept. of Applied Math, CU at Boulder. Wave propagation, tomography, image processing.

Harvey Segur - *Professor;* PhD, University of California at Berkeley. Nonlinear Waves, Fluid Dynamics, Asymptotic Methods.

Matthew Tearle- *Lecturer*; PhD, University of Colorado at Boulder. Hydrodynamic Stability Theory, Computational Fluid Dynamics.

Stephen Thomas - *Lecturer*; PhD, University of Montreal. Numerical Methods, Geophysical Fluid Dynamics.

John Williamson - *Professor Emeritus*; PhD, University of Minnesota. Statistical Methods in Genetics, Applied Probability, Mathematical Statistics.

B Affiliated Faculty { Graduate Department }

Steve C. Arendt - *Colorado Research Associates*, Theoretical Fluid Dynamics.

Mark Balas - *Aerospace Engineering, Electrical Engineering*, Control of large-scale and distributed parameter systems, system identifcation and adaptive control, Nonlinear PDE's, Numerical Methods for model reduction, controller synthesis and stability analysis.

Elizabeth Bradley - *Computer Science*, Scientific Computation, Artificial Intelligence, Nonlinear Dynamics.

Richard Byrd - *Computer Science*, Numerical Computation, Optimization Algorithms.

Xiao-Chuan Cai - *Computer Science*, Numerical and Parallel Computations.

John Cary - *Physics*, Nonlinear Dynamics, Plasma Physics, Accelerator and Space Physics.

Claudio Cio-Revilla - *Political Science*, Long-Range Analysis of War.

Senarath deAlwis - *Physics*, Theoretical Physics, String Theory, Quantum Gravity.

Thomas DeGrand - *Physics,* Numerical Methods for Quantum Field Theory.

Fred Glover - *Graduate School of Business*, Large-scale Systems, Applied Artificial Intelligence, Optimization Models.

Martin Goldman - *Physics*, Plasma Physics, Nonlinear Waves, Turbulence.

Vijay Gupta - *Geological Sciences; CIRES*, Hydrology, Stochastic Processes, Fluid Dynamics.

Weiqing Han - *Atmospheric and Oceanic Sciences*, Dynamics of the tropical ocean circulation, coupled ocean-atmospheric dynamics, process studies, numerical modeling.

Ute Christina Herzfeld - *INSTAAR, Geomathematics*, Geostatistical Analysis of Remote Sensing Data, Applications in Glaciology, Marine Geophysics and Global Change Research.

Christine M. Hrenya - *Chemical Engineering*, Gas-Particle Fluidization, Granular Flow Mechanics, Turbulent Flows, Computational Fluid Mechanics.

Tissa Illangasekare - *Environmental Science and Engineering Division, Colorado School of Mines*, Mathematical Modeling of Flow and Transport in Porous and Fractured Media, Computational Methods, Numerical Modeling.

Elizabeth Jessup - *Computer Science*, Numerical Computation, Parallel Computation.

Lakshmi Kantha - *Aerospace Engineering, CCAR, ATOC*, Numerical models of the oceans and related physical processes. Assimilation of remotely sensed data into numerical ocean models, nowcasting, and short-term forecasting of the ocean state; circulation in marginal and coastal bodies of water. Ocean-atmosphere interactions and their implications to long term weather and climate through coupled models.

David Kassoy - *Mechanical Engineering*, Fluid Dynamics, Combustion Theory, Thermal Science.

Manual Laguna - *College of Business*, Exact and Heuristic Methods for Combinatorial Optimization Problems, Network Flow Programming, Applied Artificial Intelligence.

Michael Lightner - *Electrical Engineering*, VLSI, Discrete Mathematics, Graph Theory.

Oliver McBryan - *Computer Science*, Parallel Computation, Graphics and Visualization, Computational Fluid Dynamics.

Andrew Moore - *Atmospheric and Oceanic Sciences; CIRES*, Ocean-Atmosphere Modeling.

Kamran Mohseni - *Aerospace Engineering*, Physical Applied Math, Computational Fluid Mechanics.

Douglas Nychka - *National Center for Atmospheric Research*, Geophysical Statistics.

Lev Ostrovsky - *CIRES/NOAA Environmental Technology Laboratory*, Nonlinear Waves, Fluid Dynamics, Oceanography, Acoustics.

K.C. Park - *Aerospace Engineering*, Parallel computation, Structural vibrations.

Scott Parker - *Physics*, Plasma Physics.

Carl Patton - *Physics, Colorado State University*, Solid State Physics.

Annick Pouquet - *National Center Atmospheric Research*, Physical Applied Math, Weather Prediction Models.

Harihar Rajaram - *Civil, Environmental and Architectural Engineering*, Fluid Flow, Transport Phenomena and Reactive Processes in Geologic/Geochemical Phenomena.

Barbara Robles - *Economics*, Econometrics and Monetary Theory and Policy.

Thomas F. Rutherford - *Economics*, Formulation and Analysis of Large-Scale Economic Equilibrium Models.

Robert Sani - *Chemical Engineering*, Computational Fluid Dynamics, Free and Moving Boundary Problems, Stability of Systems.

Robert Schnabel - *Computer Science, Associate Vice Chancellor for Academic and Campus Technology*, Numer. Methods for Optimization, Nonlinear Equations, Parallel Scientific Computation.

J. Michael Shull - *Astrophysical and Planetary Sciences*, Theoretical Astrophysics.

Rex Skodje - *Chemistry and Biochemistry; Joint Institute for Laboratory Astrophysics*, Nonlinear Dynamics, Quantum Chaos, Molecular Dynamics.

Renjeng Su - *Electrical Engineering*, Nonlinear Dynamics Modeling, Control, Robotics.

Juri Toomre - *Astrophysical and Planetary Sciences; Joint Institute for Laboratory Astrophysics*), Astrophysics, Mathematical Modeling, Numerical Simulation.

Henry Tufo - *Computer Science,* Computational science, parallel algorithms for high performance computers

Oleg Vasilyev - *Mechanical Engineering*, Computational Fluid Mechanics, Large Eddy Simulations of Turbulent Flow, Wavelet Methods for Modeling and Simulation of Complex Multi-Scale Phenomena, Thermal Convection Flows.

Thomas Warner - *Atmospheric and Oceanic Sciences,* Numerical modeling of mesoscal atmospheric phenomena; Marine meteorology.

Patrick Weidman - *Mechanical Engineering*, Hydrodynamic stability, solitary waves and their interaction, counter-rotating vortex rings, Stokes flow on dendrite models, similarity flows in natural convection, fluid sloshing in freely suspended containers.

Jeffrey B. Weiss - *Astrophysical and Planetary Sciences*; *Atmospheric and Oceanic Sciences*, Geophysical Fluid Mechanics, Turbulence, and Climate predictability.

Joseph Werne - *Colorado Research Associates*, Fluid dynamics.

Ellen Zweibel - *Astrophysical and Planetary Sciences*, Plasma Physics, Astrophysics.

C Visitors

Grady Wright - *University of Utah*, *Salt Lake City, UT*, 7/17/06 – 7/19/06.

Rob Maier - *Arizona University, Tucson, AZ*, 8/7/06 – 8/16/06

Elisabeth Larsson - *Uppsala University, Sweden*, 8/25-06 - 9/3/06.

Mike Rempe - 10/06/06.

Boaz Ilan - 10/27/06 - 10/31/06.

John Boyd - *University of Michigan, Ann Arbor, MI*, November 16 - 17, 2006.

Martin Mohlenkamp - *Ohio University, Athens, OH*, November 27 - December 7, 2006

Ben Herbst - *University of Stellenbosch, South Africa*, June - July, 2006.

F Staff

Marcia Flynt, Office Manager.

Doug Langley, Office Coordinator.

Charles Moseley, Accounting Technician II, Undergraduate Student Coordinator.

Susan Pryor, Graduate Program.

Anshul Mehendale, part-time student assistant.

Scott Portnoy, part-time student assistant.

3 WEEKLY COLLOQUIA and SEMINARS 2006

A Applied Mathematics Colloquium, 2006

Our Applied Mathematics Colloquium series continues to be held on Friday afternoons during the academic year at 3:00 p.m., with refreshments preceding at 2:30 PM outside the APPM conference room, ECOT 226.

Mevin Hooten, University of Missouri Columbia, Department of Statistics, January 20, 2006, *Non-linear process specifications in hierarchical spatio-temporal models*

Jing Wang, Michigan State University, Department of Statistics and Probability, January 27, 2006, *Spline-backfitted kernel smoothing of additive regression model.*

Steve Shkoller, University of California Davis, Department of Mathematics, February 3, 2006, *Well-posedness of the free-surface incompressible Euler equations with or without surface tension.*

Pavel Bochev, Sandia National Laboratory, February 10, 2006, *Mimetic discrete models with weak material laws, or least squares principles revisited.*

David Bortz, University of Michigan, Department of Mathematics, February 17, 2006, *Klebsiella pneumoniae flocculation dynamics.*

Piotr Smolarkiewicz, NCAR, February 24, 2006, *Numerical simulation of geophysical turbulence.*

Barbara Bailey, CU Denver, Department of Mathematics, *Quantifying the predictability of noisy nonlinear biogeochemical systems*

David Donoho, Stanford University, Department of Mathematics, March 10, 2006, *More unknowns than equations? Bring it on!*

Mark Ablowitz, CU Boulder, Applied Mathematics, March 17, 2006, *What you always wanted to know about solitons...*

Jeesun Jung, University of Pittsburgh, Department of Human Genetics, March 23, 2006, *Gene-dropping vs empirical variance estimation: A comparative study of standardization methods for allele-sharing statistics.*

Steve Thomas, NCAR, April 7, 2006, *Integration factor splitting for the Euler equations.*

Lakshmi Kantha, CU Boulder, Department of Aerospace Engineering Sciences, April 14, 2006, *Variability in oceanic circulation as seen in numerical hindcasts.*

Hosam Mahmoud, George Washington University, Department of Statistics, April 21, 2006, *Polya process and applications.*

Mark Rast, CU Boulder, LASP, April 28, 2006, *Lagrangian statistics in point vortex flows.*

Robert Ecke, Los Alamos National Laboratory, Center for Nonlinear Studies, May 5, 2006, *Exciting frontiers in fluid turbulence.*

Elisabeth Larsson , Uppsala University, Sweden, September 1, 2006, *Radial basis function approximations for high-dimensional PDEs.*

Per-Gunnar Martinsson , CU Boulder, Applied Mathematics, September 8, 2006, *Fast numerical techniques for solving partial differential equations.*

Mary Nelson , CU Boulder, Applied Mathematics, September 15, 2006, *Oral assessments: improvement in grades and retention.*

Anne Sheehan , CU Boulder, CIRES and Dept. of Geological Sciences, September 22, 2006, *Seismic imaging of the Earths crust and mantle.*

Roseanna Neupauer , CU Boulder, Dept. of Civil, Environmental, and Architectual Engineering, September 29, 2006, *Wavelet analysis to characterize hydraulic properties of Porous Media.*

Michael Rempe , Northwestern University, Applied Mathematics, October 6, 2006, *Efficient computational strategies for simulating neural activity on branched structures.*

Congming Li , CU Boulder, Applied Mathematics, Dept. of Mathematics, University of California at Riverside, October 13, 2006, *Dynamic stability of the 3-D axi-Symmetric Navier-Stokes equations with swirl.*

Ying Lu , CU Boulder, Dept. of Sociology, October 20, 2006, *Verbal autopsy methods with multiple causes of death.*

Jim Keener , University of Utah, Distinguished Professor of Mathematics, Adjunct Professor of Bioengineering, October 27, 2006, *How cells make measurements.*

Greg Lyng , Univeristy of Wyoming, Dept. of Mathematics, November 3, 2006, *The secondary caustic in the semiclassical limit for the focusing nonlinear Schrodinger Equation.*

Richard Rotunno, NCAR, Earth and Sun Systems Laboratory, November 10, 2006, *A generalization for Lorentzs Model for the predictability of ows with many scales of motion.*

John Boyd, University of Michigan, Dept. of Atmospheric, Oceanic, and Space Science, November 17, 2006, *Exponentially accurate runge-free approximation from samples on an evenly-spaced grid for non-periodic functions.*

B Seminars in Applied Mathematics (Nonlinear Waves Seminar), 2006-2007

The Department maintained the Applied Mathematics Seminar, a weekly seminar series at 4:00 p.m. on Tuesday afternoons. A list of visiting speakers and the titles of their talks follows:

Theodoros Horikis, CU Boulder, Department of Applied Mathematics, September 12, 2006, Self transform functions and self transform operators.

Tom Ivey, College of Charleston, Department of Mathematics, September 19, 2006, Geometry and topology of nite-gap vortex filaments.

Cory Ahrens, CU Boulder, Department of Applied Mathematics, September 26, 2006, Collision induced timing shifts in quasi-linear fiber optic communication systems.

Barbara Prinari, Universit di Lecce, Dipartimento de Fisica and Sezione INFN, October 3, 2006, Inverse scattering transform for an integrable discretization of the defocusing nonlinear Schrodinger equation with non-vanishing boundary conditions.

Barbara Prinari, Universit di Lecce, Dipartimento de Fisica and Sezione INFN, October 10, 2006, Inverse scattering transform for an integrable discretization of the defocusing nonlinear Schrodinger equation with non-vanishing boundary conditions: Part II.

Mark Hoefer, CU Boulder, Department of Applied Mathematics, NIST, October 24, 2007, Nano nonlinear waves: Magnetodynamics of Point Contact Oscillators.

Boaz Ilan, University of California Marced, School of Natural Sciences, October 31, 2006, Existence and instabilities of solutions in inhomogeneous media.

Mark Hoefer, CU Boulder, Department of Applied Mathematics, NIST, November 7, 2006, Dispersive shock wave interactions: collisions and merging.

Robert Maier, University of Arizona, Department of Mathematics and Physics, November 14, 2006, Transforming nonclassical elliptic integrals.

Sarbarish Chakravarty, CU Colorado Springs, Department of Mathematics, November 28, 2006, Combinatories of the elastic N-Soliton solutions of KPII.

C Seminar in Computational Mathematics, 2006-2007

Most of the meetings this year consisted of the general discussion from 10 to 11:30 am surrounded by special research meetings. However, we continued to have an occasional lecture as shown below. All meetings were held at 1320 Grandview{on the northwest corner of campus near University and Broadway.

Bob Weaver, Los Alamos National Laboratory, August 29, 2006, "An Overview of the Los Alamos Crestone Project: Moving Towards Petaop Computing".

Srinath Vadlamani and Scott Kruger, Tech-X, October 10, 2006, "Current Challenges in Computational Modeling of Magnetized Fusion Plasmas with the Fluid Descriptions".

Hans De Sterck, University of Waterloo, January 30, 2007, "Markov chains and web ranking: a multilevel adaptive aggregation method".

Andrew J. Christlieb, Ph.D.; Assistant Professor, Department of Mathematics, Michigan State University, February 6, 2007, ""Simulations of Plasma Dynamics using a Grid Free Technique".

Serpil Kocbiyik, Memorial University of Newfoundland, March 13, 2007, "Numerical Simulation of Free Surface Flow Past an Oscillating Cylinder".

Jose Garcia, CU Boulder, April 17, 2007, "Determination of the magnetic field of the sun's photosphere based on the solution of the radiative transfer equation in a Milne-Eddington atmosphere"

Franck Vernerey, CU Boulder, August 28, 2007, "multi-scale problems in solid mechanics and numerical strategies".

Mike Levy, CU Boulder, September 18, 2007, "A high-order Galerkin solver for the global shallow water equations".

Dusan Odstrcil, CU Boulder, NOAA/Space Environment Center, October 2, 2007, "Challenges in Magneto-hydrodynamic Modeling of Solar Wind Transients with Application to Space Weather Forecasting".

James Adler, CU Boulder, October 9, 2007, "FOSLS-AMG on a 2D Reduced Resistive MHD Problem".

Adrianna Gillman, CU Boulder, October 23, 2007, "The numerical performance of a mixed-hybrid type solution methodology for solving high-frequency Helmholtz problems".

Chris Woods, CU Boulder, November 13, 2007, \Exploration of mechanistic changes in vascular structure associated with pulmonary hypertension modeled with CFD".

D Dynamical Systems Seminars, 2006-2007

The weekly Dynamical Systems Seminar is a research working group led by James Meiss, held on Thursday afternoons at 2:00. The following is a list of the speakers and the titles of their talks:

Anca Radulescu, CU Boulder, August 31, 2006, "Is topological entropy computable?"

Michael Watson, CU Boulder, September 31, 2006, " Building on K41 - Looking for New Inertial Ranges in Rotating/Stratified Flows OR Twelve Weeks in Los Alamos: Small Town...Big Math".

David Simpson, CU Boulder Applied Math, September 14, 2006, "Bifurcations in Piecewise Smooth Systems".

Sven Schmidt, CU Boulder Applied Math, September 21, 2006, "Resonance in Hamiltonian Systems".

Stephen Preston, CU Boulder Mathematics, September 28, 2006, "Volumorphism geometry and fluid mechanics".

David Bortz, CU Boulder Applied Math, October 5, 2006, "Modeling and Analysis of Polydisperse Disseminated Bacterial Infections".

Gerard Misiolek. Notre Dame, October 12, 2006, "Geometric approach to the Euler equations".

Jim Meiss, CU Boulder Applied Math, October 19, 2006, " Normal forms for Volume Preserving Maps: Everything you wanted to know about this year's Applied Math T-shirt".

Bob Easton, CU Boulder Applied Math Emeritus Professor, October 26, 2006, "Perspectives of an Amateur Economist".

Patrick Young, CU Boulder Applied Math, November 2, 2006, " Electrostatic Modeling of EWOD-actuated Microdroplets"

Holger Dullin, Loughborough University, November 9, 2006, "Another look at the saddle-centre bifurcation: Vanishing Twist".

David Bortz, CU Boulder Applied Math, November 30, 2006, " ".

Jeffrey Weiss, PAOS, CU Boulder, December 7, 2006, "Coherent Plumes in Rapidly Rotating Convection".

E Joint Probability and Statistics Seminars, 2006-2007

These sessions were organized jointly with the Math Department, and were held on Wednesday afternoons at 3:30 pm. in Math 220.

Elena Zhizhina, Institute for Information Transmission Problems (Moscow, Russia), August 30, 2006, "Stochastic Markov evolutions in continuum".

B. Rider, Department of Math, CU Boulder, September 13, 2006, "The old Riccati map and RMT"

F Undergraduate and Graduate Seminars, 2006-2007

SIAM Undergraduate Chapter/Undergraduate Seminars

The CU Boulder undergraduate chapter of SIAM, one of the newest engineering societies at CU, was founded to promote interactions between Applied Math students and faculty. Society functions include technical presentations by students, faculty, and industry speakers, field trips and student/faculty social events|all designed to introduce undergraduates to the widespread use of applied mathematics in engineering and the sciences. All interested students, from any major, are encouraged to participate in SIAM-sponsored events.

4 FACULTY SERVICE TO THE UNIVERSITY, DEPARTMENT

AND SOCIETIES, CALENDAR YEAR 2006

TEACHING ACTIVITIES

A Courses Taught by Department Faculty,