

# DEPARTMENT OF APPLIED MATHEMATICS

Annual Report 2007



Colorado

# 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;*
- 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 government, industry, laboratories, and the hemauademicovidfeon, lab prestonass.

# Annual Report 2007

## Table of Contents

<b>Overview</b>		<b>1</b>
<b>Departmental Activities</b>		<b>2</b>
Undergraduate Education	2	
Graduate Education	3	
Enrollment Statistics	4	
Graduates	6	
Changes in Personnel	8	
Faculty Awards and Honors	9	
<b>Faculty, Instructors, Research Associates, Visitors, and Staff</b>		<b>10</b>
Core Faculty, Instructors, and Research Associates	10	
Affiliated Faculty – Graduate Department	11	
Visitors in 2007	13	
Staff	15	
<b>Weekly Colloquia and Seminars</b>		<b>16</b>
Applied Mathematics Colloquium	16	
Nonlinear Waves Seminars	18	
Computational Mathematics Seminars	19	
Dynamics Seminars	20	
Undergraduate and Graduate Organizations	21	
<b>Research</b>		<b>22</b>
Department-wide Grants	22	
Individual Research Grants	24	
Publications	26	
Invited Lectures and Meetings Attended	29	
<b>Outreach</b>		<b>36</b>
<b>Faculty Service to the University, Department, and Societies</b>		<b>37</b>
Teaching Activities	45	
Undergraduate Courses Taught by Department Faculty	45	
Graduate Courses Taught by Department Faculty	46	

# Overview

The Department of Applied Mathematics is steeped in strategies and traditions giving students three core advantages: Communication skills, Computational skills, and Mathematical skills. Along with these core skills, the Department strives to educate and train its students in the tools, methods, and strategies of solving real world problems. We believe that history continues to show that the question is not whether mathematics will be applied—the only question is where and when!

Our mission is little different from the Engineering Mathematics Department's mission from 1906. Since 1996, the Applied Mathematics community, composed of the department's students, faculty, and staff, has addressed its objectives with admirable levels of engagement.

The Department offers a Bachelor of Science (BS) in Applied Mathematics, as well as a minor, and a five-year concurrent Bachelor of Science/Master of Science (BS/MS) degree. At the Graduate level, the department offers the Master of Science (MS) and Doctor of Philosophy (PhD) degrees. This past 2007 year, Applied Mathematics had 15 tenure and tenure-track faculty, five instructors, and several lecturers who taught 14,347 undergraduate credit hours and 799 graduate credit hours. In 2007, there were

# Departmental Activities

## Undergraduate Education

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 its 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.

### **Applied Mathematics Students Enter Math Modeling Contest**

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 The Consortium for Mathematics and its Applications (COMAP). Students from all science, math, and engineering majors are encouraged to enter and any undergraduate student, regardless of major, may participate; however, participants may not have a college degree.

The 2007 Math Modeling Contest took place February 8-12. Four teams of University of Colorado at Boulder students, a total of 12 students, and three faculty sponsors, Anne Dougherty and Bengt Fornberg from the Department of Applied Mathematics, and Mike Ritzwoller from the Department of Physics, participated in this activity. The contest began at 6:01 P.M. on Thursday, February 8 and ended at 6:00 P.M. Monday, February 12. Students worked in teams of three, using any inanimate reference sources

exist. In addition to his Applied Mathematics research, Safdi works in the Physics Optics Lab and will co-author a paper with members of that department to appear in a forthcoming issue of Science. Safdi is an outstanding student with a 4.0 GPA and in his free time away from studies and research, is fluent in Japanese, a world traveler, and a competitive rock climber.

For further information on the Astronaut Scholarship foundation, visit: [www.astronautscholarship.org](http://www.astronautscholarship.org).

## Enrollment Statistics

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

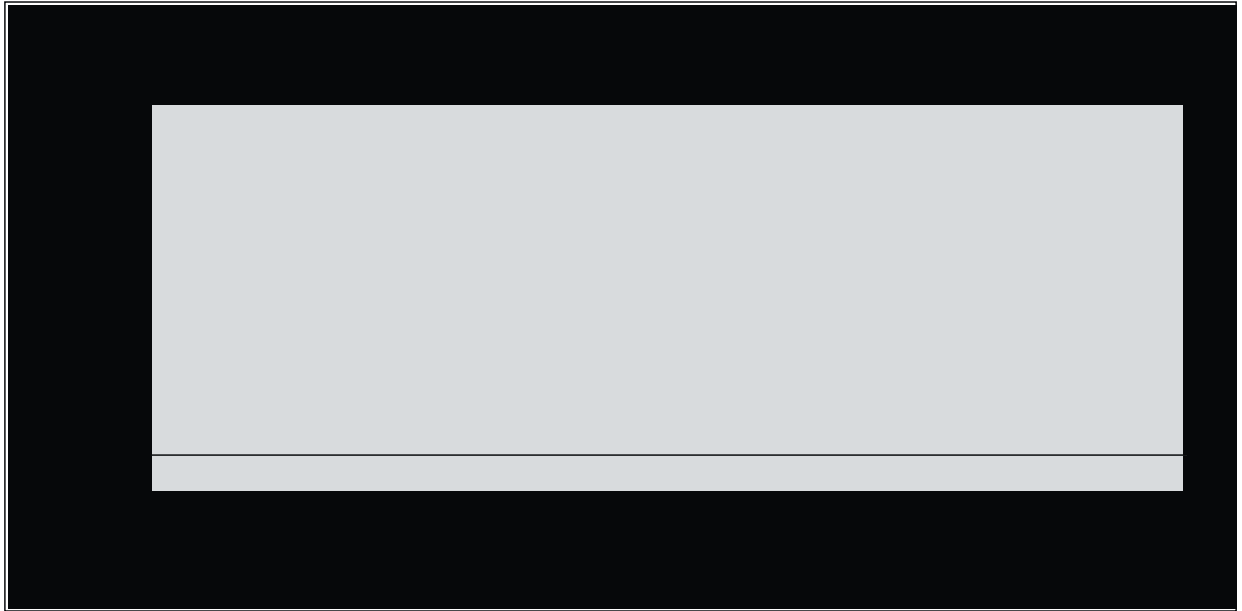
Year	Total Number of Enrolled Students in All Courses	Number of Enrolled		
		Graduate Students	Undergraduate Majors	Undergraduate Minors
1991-92	2781	27	50	
1992-93	2797	28	47	
1993-94	2809	33	47	
1994-95	2670	39	51	
1995-96	2734	40	54	
1996-97	2973	46	52	
1997-98	3108/3323*	51	44	
1998-99	3172/3566*	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 (Calendar)	3690/4189*	76**	110**	57**
2007 (Calendar)	3947/4491*	86***	125**	65**

\*The numbers in bold include all Calculus I and II Work Study Groups, as well as Calculus III Labs and Differential Equations Labs. Enrollment in our upper division courses has continued to increase. With projected increases in undergraduate enrollment, the Department continues to foresee enrollment increases in Applied Mathematics courses.

\*\*Number of unduplicated students.

\*\*\* Spring 2007 had 64 graduate level students. Fall 2007 had 68 graduate level students. This shows a net gain of four students between academic years. In Fall 2007, 23 new students entered the program.

**Undergraduate Enrolled Upper-Division Student Credit Hours**





# Graduates

May 2007

## PhD

Chao Jin

*Parallel Domain Decomposition Methods for Stochastic Partial Differential Equations and Analysis of Nonlinear Integral Equations*

Advisor: Xiao-Chuan Cai and Congming Li

Brendan Sheehan

*Multigrid Methods for Isotropic Neutron Transport*

Advisor: Thomas Manteuffel

## MS

Danielle Bousquet

Peter Charbonneau

Jose Garcia

*Determination of the Magnetic Field of the Sun's Photosphere Based on the Solution of the Radiative Transfer Equation in a Milne-Eddington Atmosphere*

Advisor: Thomas Manteuffel

Jennifer Fox

James Lawrence

Pete Schmitt

David Wilkens

## BS/MS

Nathan Balk

*Concept Questions in Calculus I: Pinpointing Students' Difficulties and Misconceptions*

Advisor: Mary Nelson

Bradley Klingenberg

*Non-negative Matrix Factorization: The Extreme Data Property and Issues of Ill-Posedness*

Advisor: James Curry and Anne Dougherty

Kristopher Tucker

*Query-seeded Concept Decompositions and a New Approach to Performance Quantification in Information Retrieval*

Advisor: James Curry and Anne Dougherty

## BS

Brandon Booth

Eric Burns

Jesus Hierro-Salinas

Amy Hirschman

Thomas Josephson

Gisella Kagy

Rachel Keyser

Andrew Ledvina

John Lewis

McCall Mullen

Salvatore Rigatti

Henry Romero

Christopher Smith

Kate Spooner

John Steffan

Bryan Wren



**MS (cont.)**

Curtis Higgins

**BS**

Craig Fogle

David Goluskin

Brandon Gonzales

David Roth

Tedy Weber

## Changes in Personnel

### **Tiejun Tong Joins Department as Assistant Professor**

Dr. Tiejun Tong was hired to fill the Assistant Professor position in the area of Statistics, his appointment beginning in the fall semester of 2007. Dr. Tong received his PhD in Statistics from the University of California, Santa Barbara in 2005. He received a BS

### **Anne Dougherty Receives Faculty Outstanding Advisor Award**

Dr. Anne Dougherty was awarded the Faculty Outstanding Advisor Award from the University of Colorado College of Engineering. Dr. Dougherty was also recognized in the Summer 2007 issue of Colorado Engineer Magazine, a publication created by the University of Colorado Engineering School.

### **Jim Meiss on Sabbatical**

Dr. Jim Meiss took a year sabbatical in 2007. He spent his spring semester at the Math Sciences Research Institute in Berkeley as a Research Professor in Mathematics. He then traveled to and around England, Austin, and several other locales before returning to the Department for 2008.

### **Mary Nelson Receives Awards for her Commitment to Success**

Dr. Mary Nelson received two awards recognizing her commitment to success at the University of Colorado at Boulder. She was awarded the CU Multicultural Engineering Program faculty award for her commitment to the success of Multicultural Engineering Program (MEP) scholars, and also received the University of Colorado at Boulder Leadership, Excellence, Achievement, and Diversity Alliance (CU LEAD) Faculty Appreciation Award for her work with CU-LEAD Scholars. Dr. Nelson is a member of the Defense Agency Committee on Women in the Services (DACOWITS), 2005-2007. She also serves as the Chair for this national committee.

### **Adam Norris Receives John and Mercedes Peebles Award**

In 2007, Dr. Adam Norris, an Applied Mathematics instructor, was awarded the John and Mercedes Peebles Award for Innovation in Education. The Innovation in Education award recipient was nominated and decided by student vote and presented at the May 2007 Recognition Ceremony.







**Juri Toomre** – *Astrophysical and Planetary Sciences (APS)*; Astrophysics, Mathematical Modeling, Numerical Simulation.

**Henry Tufo** – *Computer Science*; Computational Science, Parallel Algorithms for High Performance Computers.

**Oleg V. 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 (ATOC)*; Numerical Modeling of Mesoscale 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 (APS)*, *Atmospheric and Oceanic Sciences (ATOC)*; Geophysical Fluid Mechanics, Turbulence, and Climate predictability.

**Joseph Werne** – *Colorado Research Associates*; Fluid dynamics.

## Visitors in 2007

**Tom Bogdan** - National Oceanic and Atmospheric Administration (NOAA), Boulder, CO. January 19, 2007

**Larry Hunter** - University of Colorado at Denver and Health Sciences Center, Denver, CO. January 26, 2007

**Hans De Sterck** - University of Waterloo, Waterloo, ON, Canada. January 30, *Sponsor: Tom Manteuffel and Steve McCormick*

**Gadi Fibich** - Tel Aviv University, Tel Aviv, Israel. January 30, 2007

**Andrew J. Christlieb** - Michigan State University, East Lansing, MI. February 5, 2007

**Mingzhong Wu** - Colorado State University, Fort Collins, CO. February 27, 2007.

**Harry Swinney** - University of Texas at Austin, Austin, TX; February 29, 2007

**Leslie Greengard** - New York University, New York City, NY. March 2, 2007

**Matteo Sommacal** – Post Doctoral Fellow, Perugia, Italy. March 6 through May 29, *sponsor: Mark Ablowitz*.

**Peter Lax** - New York University, New York City, NY. March 9, 2007

**Serpil Kocabiyyik** - Memorial University of Newfoundland, St. John's, NL, Canada. March 13, 2007.

**Alexander Tovbis** - University of Central Florida, Orlando, FL. March 13, 2007.

**Peter Teets** - Former President of Lockheed Martin, Former Under Secretary of the United States Air Force. March 16, 2007

**William L. Kath** - Northwestern University, Chicago, IL. April 3, 2007.

**Karima Khusnutdinova** - Loughborough University, Leicestershire, UK. April 10, 2007

**Natasha Flyer** - National Center for Atmospheric Research (NCAR), Boulder, CO. April 13, 2007

**Mark Bradley** - Colorado State University, Fort Collins, CO. April 24, 2007.

**Dongbin Xiu** - Purdue University, West Lafayette, IN. April 27, 2007

**Bob Eisenberg** - Rush University Medical Center, Chicago, IL. May 4, 2007



**Ken Miller** – Wichita State University, Wichita KS. August 1 through December 1, *sponsor: Bengt Fornberg.*

**Elisabeth Larsson** – Uppsala University, Sweden. August 25 through September 3, *sponsor: Bengt Fornberg.*

**Cleve Moler** - Math Works, Inc., Natick, MA. September 7, 2007

**Barbra Prinari** - Università di Lecce, Lecce, Italy. September 11, 2007.

**Juan G. Restrepo** - Northeastern University, Boston, MA. September 14, 2007

**Joe Grear** - Lawrence Berkeley National Laboratory, Berkeley, CA. 2007 September 21, 2007

**Travis Austin** - Los Alamos National Laboratory, Los Alamos, NM. September 28, 2007.

**Luis Chacon** - Los Alamos National Laboratory, Los Alamos, NM. October 12, 2007.

**John R. Cary** - Tech X Corporation, Boulder, CO. October 19 2007.

**Randy LeVeque** - University of Washington, Seattle, WA. October 26, 2007

**Mark Hoefler** - United States Department of Commerce, National Institute of Standards and Technology (NIST). October 30, 2007

**Mike Wakin** - California Institute of Technology, Pasadena, CA. November 2, 2007.

**Oleg Emanouilov** - Colorado State University, Fort Collins, CO. November 6, 2007.

**Igor Krichever** - Columbia University, New York City, NY., November 6, 2007.

**Martin Mohlenkamp** – Ohio University, Athens, OH. November 27 through December 7, *sponsor: Gregory Beylkin.*

**James Brannick** - Penn State University, University Park, PA. December 7, 2007.

## Staff

**Marcia Flynt** – Department Administrator.

**Susan Pryor** – Graduate Program Assistant.

**David Hanley** – Accounting Technician and Undergraduate Program Assistant.

**Ian Campbell** – Internet/Publications Designer and Art Director.

**Loren Ellison, Colin Misare, Scott Portnoy, Joann Yecies** - Part Time Student Assistants.



**Juan G. Restrepo**, Northeastern University, Center for Interdisciplinary Research On Complex Systems, 2007 September 14, *Dynamics on Complex Networks: Synchronization, Percolation and the Dynamical Importance of Nodes and Links*.

**Joe Grear**, Lawrence Berkeley National Laboratory, 2007 September 21, *John von Neumann and the Origins of Scientific Computing*.

**Travis Austin**, Los Alamos National Laboratory, 2007 September 28, *Cardiac Activation Modeling Using Fast Multilevel Solvers*.

**Luis Chacon**, Los Alamos National Laboratory, 2007 October 12, *On Fully Implicit Methods for Extended Magnetohydrodynamics*.

**John R. Cary**, Tech X Corporation, 2007 October 19, *Self-Consistent Electromagnetic Modeling With Boundaries*.

**Randy LeVeque**, University of Washington, 2007 October 26, *Shock Wave Propagation in Tissue and Bone*.

**Mike Wakin**, California Institute of Technology, 2007 November 2, *The Geometry of Compressed Sensing*.

**Francois G. Meyer**, University of Colorado at Boulder, 2007 November 9, *We Can Read Your Mind: The Decoding of fMRI Datasets*.

**Liz Bradley**, University of Colorado at Boulder, 2007 November 16, *Dynamics of Data Assimilation*.

**Greg Tucker**, University of Colorado at Boulder, 2007 November 30, *Numerical Modeling of Landscape Evolution*.

**James Brannick**, Penn State University, 2007 December 7, *Multigrid Solvers for Lattice QCD*.

## Nonlinear Waves Seminars

*The Applied Mathematics Nonlinear Waves seminars were held on Tuesday afternoons during the academic year at 4:00 P.M. The seminars were offered in association with APPM 7300, **Nonlinear Waves and Integrable Equations**. Mark Ablowitz chaired and organized the Seminar Series, in association with Douglas Baldwin.*

**Gadi Fibich**, School of Mathematical Sciences, Tel Aviv, Department of Applied Mathematics, 2007 January 30, New Singular Solutions of the Nonlinear Schrodinger Equation (NLS), *Waves in Nonlinear Lattices: Ultrashort Optical Pulses and Bose-Einstein*

**Mark Bradley**, Colorado State University, Department of Physics, 2007 April 24.

**Barbra Prinari**, Università di Lecce, Dipartimento di Fisica and Sezione INFN, 2007 September 11, *Analyzing Quality with Generalized Kinetic Models*.

**Yeon Kil Jung**, University of Colorado at Boulder, Department of Applied Mathematics, 2007 September 18, *Non-Linear Dispersive Wave Propagation and Reflection in Complicated Bottom Profiles*.

**Cory Ahrens**, University of Colorado at Boulder, Department of Applied Mathematics, 2007 October 9, *An Informal Talk: A Brief Introduction to Inverse Problems*.

**Ute C. Hertzfeld**, University of Colorado at Boulder, Department of Applied Mathematics, 2007 October 16, *Identification of Surface Features in Remote-Sensing Signals*.

**Mark Hoefler**, United States Department of Commerce, National Institute of Standards and Technology (NIST), 2007 October 30, *Waves in Nanomagnets*.

**Oleg Emanouilov**, Colorado State University, Department of Mathematics, 2007 November 6, *Controllability and Observability of Evolution Equations*.

**Igor Krichever**, Columbia University, Department of Mathematics, 2007 November 6, *Isomonodromy Transformation and Analytic Theory of Difference Equation*.

## Computational Mathematics Seminars

*The Applied Mathematics Computational Mathematics seminars were held on Tuesday mornings during the academic year at 10:00 A.M. , at 1320 Grandview Terrace - the headquarters of the department's Computational Mathematics group. The seminars were offered in association with APPM 8600, **Joint Computational Mathematics Seminar**. Steve McCormick chaired and organized the Seminar Series.*

**Hans De Sterck**, University of Waterloo, 2007 January 30, *Markov Chains and Web ranking: A Multilevel Adaptive Aggregation Method*.

**Andrew J. Christlieb**, Michigan State University, 2007 February 5, *Simulations of Plasma Dynamics Using a Grid Free Technique*.

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

**Jose Garcia**, University of Colorado, 2007 April 17, *Determination of the Magnetic Field of the Sun's Photosphere Based on the Solution of the Relative Transfer Equation in a Milne-Eddington Atmosphere*.

**Franck Vernerey**, University of Colorado at Boulder, Department of Civil, Environmental, and Architectural Engineering, 2007 August 28, *Multiscale Problems in Solid Mechanics and Numerical Strategies*.

**Mike Levy**, University of Colorado at Boulder, 2007 September 18, *A High-order Galerkin Solver for the Global Shallow Water Equations*.

**Dusan Odstrcil**, University of Colorado at Boulder, National Oceanic and Atmospheric Administration (NOAA), Space Environment Center, 2007 October 2, *Challenges in Magnetohydrodynamic Modeling of Solar Wind Transients with Application to Space Weather Forecasting*.

**James Adler**, University of Colorado at Boulder, 2007 October 9, *FOSLS-AMG on a 2D Reduced Resistive MHD Problem*.

**Adrianna Gillman**, University of Colorado at Boulder, 2007 October 23, *The Numerical Performance of a Mixed-hybrid Type Solution Methodology for Solving High-frequency Helmholtz Problems*.

**Markus Pflaum**, University of Colorado at Boulder, 2007 October 30, *Pseudodifferential Operators With A View Towards the Singular Setting*.

**Chris Woods**, University of Colorado at Boulder, 2007 November 13, *Exploration of Mechanistic Changes In Vascular Structure Associated With Pulmonary Hypertension Modeled With CFD*.

## Dynamics Seminars

*The Applied Mathematics Dynamics seminars were held on Thursday afternoons during the academic year at 2:00 P.M. The seminars were offered in association with APPM 8100, **Seminar in Dynamical Systems**. David Bortz, Keith Julien, and James Meiss co-chaired and organized the Seminar Series.*

**Anca Radulescu**, University of Colorado at Boulder, 2007 February 8.

**Nahum Aray**, University of Colorado at Boulder, Department of Physics, 2007 February 15.

**Glen Stewart**, University of Colorado at Boulder, Laboratory for Atmospheric and Space Physics, 2007 March 1.

**Jillian Hartford**, University of Colorado at Boulder, Department of Civil Engineering, 2007 March 22.

**Luis Melara**, Colorado College, 2007 April 12.

**Joe Kubitscheck**, University of Colorado at Boulder, Department of Mechanical Engineering, 2007 April 19.

**Juan Restrepo**, Northeastern University, 2007 September 13, *Synchronization in Large Networks of Dynamical Systems*.

**Robert W. Easton**, University of Colorado at Boulder, 2007 September 20, *Rational Decisions in an Uncertain World*.

**James Meiss**, University of Colorado at Boulder, 2007 September 27, *Some Dynamics of Volume Preserving Maps*.

**Manuel Lladser**, University of Colorado at Boulder, 2007 October 11, *Sufficient Markovian Embeddings of Non-Markovian Sandom Sequences*.

**Michael Watson**, University of Colorado at Boulder, 2007 October 18, *Pseudo-Inverses and Linear Stability Analysis*.

**Gregory P. Chini**, University of New Hampshire, 2007 October 25, *Asymptotic Analysis of Strongly Nonlinear Convection in the Ocean Surface Mixed Layer*.

**Benjamin Jamroz**, University of Colorado at Boulder, 2007 November 1, *Reduced Modeling of the Magnetorotational Instability*.

**Glen Stewart**, University of Colorado at Boulder, Laboratory for Atmospheric and Space Physics (LASP), 2007 November 8, *Coexistence of Liquid and Vapor Phases in Saturn's Rings*.

**Colleen Webb**, Colorado State University, Biology, 2007 November 15, *The Role of Spatial Modularity In Ecosystem Robustness*.

**John Younger**, University of Michigan, Department of Emergency Medicine, 2007 November 29, *Dynamics of Blood Stream Infection*.

**Jutta Bikowski**, Colorado State University, Department of Mathematics, 2007 December 6, *The Conductivity Problem: Calderon's Method and Direct Reconstructions*.

# Undergraduate and Graduate Organizations

## Society for Industrial and Applied Mathematics (SIAM)

The University of Colorado at Boulder undergraduate chapter of the Society for Industrial and Applied Mathematics (SIAM) was founded to promote interactions between Applied Mathematics 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.

The graduate student chapter of SIAM at the University of Colorado at Boulder is a low-pressure, informal setting for discussing and learning about applied mathematics. The graduate student chapter holds regular meetings every other Thursday throughout the academic year. Faculty are not allowed at these meetings and the atmosphere is very low-key so that students can feel free to ask questions that they may not otherwise address to faculty members. Other activities include the Front Range Applied Mathematics Student Conference and trips to visit local industry and research groups.

The 2007-2008 SIAM University of Colorado at Boulder Undergraduate Chapter Officers were Co-Presidents Joseph Adams,

# Research

*Department of Applied Mathematics faculty continue to demonstrate appreciable accomplishments in research.*

## Department-wide Grants

### **Mentoring Through Critical Transition Points**

During Fall 2006, the Department of Applied Mathematics received a grant from the National Science Foundation (NSF) entitled Mentoring Through Critical Transition Points (MCTP). The grant provides fiscal resources for student research and focuses on strengthening the links between undergraduate students, graduate students, and faculty while simultaneously encouraging students to pursue advanced degrees in Applied Mathematics. Each year, between 15 and 20 Applied Mathematics undergraduates have the ability to receive stipends, allowing them to further explore their research interests. Initially recruited as freshmen through honors seminars, individuals are invited to join small research seminars led by faculty and advanced graduate students as sophomores and juniors.

Professor James Curry heads MCTP along with co-investigators Anne Dougherty, Keith Julien, James Meiss and Harvey Segur. All have extensive experience working with undergraduates, both in the classroom and on individual research projects. According to Associate Department Chair, Anne Dougherty, "Experiences in the department over the past decade strongly support the proposition that undergraduate research projects early in the careers of students can be life changing. Students learn that they can make unique and original contributions to the mathematical sciences, and many are motivated to continue their education by taking more challenging courses and continuing on to graduate school. As a consequence, Applied Mathematics alumni can be found in some of the most prestigious graduate programs in the country."

Previously, undergraduate research was funded through an NSF Vertical Integration of Research and Education (VIGRE) grant. When that grant ended in the Spring of 2007, the Department shifted its focus to MCTP.

Under MCTP, undergraduates are provided with valuable research experience and preparation for the pursuit of an advanced degree while graduate students are simultaneously given experience in advisory positions. Research under MCTP is expected to increase the number of undergraduate Applied Mathematics majors at the University of Colorado at Boulder, increase enrollment in upper division mathematics courses, and increase the number of students who pursue advanced degrees in math and other sciences nationwide.





December 1 – 2007 November 30; PI: Ablowitz MJ, Curry JH.

NSF: “Noyce Fellowships”; 2004 July – 2008 December; PI: Ablowitz MJ, [Other PIs Unknown at the Time of This Publication].

### **Fornberg, Bengt**

NSF: “Pseudospectral Methods and Radial Basis Functions”; Award No.: DMS- 0309803; 2003 September 1 – 2007 August 31; PI: Fornberg B.

NSF: “Radial Basis Functions”; Award No.: DMS-0611681; 2006 September 1 – 2009 August 31; PI: Fornberg B.

DOD ARO: “Training Knowledge and Skills for the Networked Battlefield”; Award No.: W9112NF-05-1-0153; 2005 May 1 – 2010 April 30; PI: Fornberg B.

NSF-ATM: “CMG - Freedom from Coordinate Systems and Spectral Accuracy with Local Refinement: Radial Basis Functions for Climate and Space-Weather Prediction”; Award No.: 0620068; 2006 September 1 – 2009 August 31; PI: Fornberg B. Collaborative Research.

### **Julien, Keith**

NASA: Solar Heliospheric Program: “Modeling Magneto-Inertial-Gravity waves in the Lower Convection Zone”; 2007; PI: Julien K.

NASA: Living with a Star Guest Investigator Program: “Community Hounds and Hares Exercises in Local Helioseismology”; PI: Julien K.

Innovative Seed Grant: “Multi-scale Modeling and Simulation in the Geosciences: Towards Petascale Computing”; 2007; P. I.: Julien K.

NSF: “Opportunities for Research Collaborations between the Mathematical Sciences and Geosciences”; Award No.: DMS-0724859; 2007 – 2008; PI: Julien K.

### **Li, Congming**

NSF: “Qualitative properties of nonlinear differential and integral equations”; Award No.: DMS-0401174; 2005 – 2007; PI: Li C.

### **Lladser, Manuel**

NIH: “Scientific Computation for RNA Catalysis of Translational Reactions”; 2007 October 1 – 2010 January 31; PI: Yarus M, Lladser M.

### **Manteuffel, Tom**

DOE: “First-order system least-squares (FOSLS) for nonlinear systems arising from DOE applications”; Award No.: DE-FG02-03ER25574; 2006 November 15 – 2009 October 1; PI: Manteuffel T, McCormick S.

NSF: “hp-adaptive FOSLS methods for nonlinear problems with singularities”; Award No.: DMS-0410318; 2004 October – 2007 September; PI: Manteuffel T, McCormick S.

NSF MRI Grant; 2004 November – 2007 December; PI: Tufo H.

NSF: “CMG: Modelling River Basin Dynamics: Parallel Computing and Advanced Numerical Methods”; Award No.: EAR – 0621199; 2006 September 15 – 2010 August 31; PI: Peckham S, Manteuffel T, McCormick S, Tucker G.

DOE: “Towards Optimal Petascale Simulation (TOPS)”; 2006 September 15 – 2011 September 9; PI: McCormick S, Cai XC, Man-



155-186.

### **Beylkin, Gregory**

Beylkin G, Cramer R, Fann G, Harrison RJ. 2007. *Multiresolution separated representations of singular and weakly singular operators*, Appl. Comp. Harmonic Anal. 23: 235-253.

Beylkin G, Kurcz C, Monzon L. 2007. *Grids and transforms for band-limited functions in a disk*. Inverse Problems 23: 2059-2088.

### **Bortz, David**

Li D, Hohne D, Bortz DM, Bull J, Younger JG. 2007. *Modeling bacterial clearance from the bloodstream using computational fluid dynamics and monte carlo simulation*. Journal of Critical Care 22(4): 344.

Younger JG, Chung HY, Cartwright M, Bortz DM, Jackson TL. 2007. *Neutropenic S. epidermidis bacteremia modeled as a pharmacodynamic system*. SHOCK: 68-69.

### **Curry, Jim**

Klingenberg B, Curry J, Dougherty A. 2007. *Non-Negative Matrix Factorization*, Submitted, Pattern Recognition.

### **Dougherty, Anne**

Klingenberg B, Curry J, Dougherty A. 2007. *Non-Negative Matrix Factorization*, Submitted, Pattern Recognition.

### **Fornberg, Bengt**

Fornberg B, Zuev J, Lee J. 2007. *Stability and accuracy of time-extrapolated ADI-FDTD methods for solving wave equations*, Journal of Computational and Applied Mathematics 200: 178-192.

Fornberg B, Zuev J. 2007. *The Runge phenomenon and spatially variable shape parameters in RBF interpolation*, Computers and Mathematics with Applications. 54: 379-398.

Fornberg B, Piret C. 2007. *A stable algorithm for flat radial basis functions on a sphere*. SIAM J. Sci. Comput. 30: 60-80.

### **Julien, Keith**

Petersen M, Julien K, Stewart GR. 2007. *Baroclinic vorticity production in protoplanetary disks. I. Vortex Formation*. Astrophysical Journal 658 (2): 1236-1251.

Petersen M, Stewart GR, Julien K. 2007. *Baroclinic vorticity production in protoplanetary disks. II. Vortex Growth and Longevity*. Astrophysical Journal 658 (2): 1252-1265.

Julien K, Knobloch E. 2007. *Reduced Models for Fluid flows with Strong Constraints*. Journal of Mathematical Physics 48 (6): Art No. 065405 (34 pages).

### **Li, Congming**

Jin C, Cai X, Li C. 2007. *Parallel Domain Decomposition Methods for Some Stochastic Partial Differential Equations*. SIAM J. of Sci. Comp. 2: 2096-2114.

Li C, Lim J. 2007. *The singularity analysis of solutions to some systems of integral equations*. Comm. Pure and Appl. Anal. 6(2):

**Lladser, Manuel**

Lladser M. 2007. *Uniqueness of polynomial canonical representations*. Discrete Mathematics and Theoretical Computer Science Proceedings: AH, 463-470.

**Manteuffel, Tom**

Chang B, Manteuffel TA, McCormick SF, Sheehan B. 2007. *Spatial multigrid for isotropic neutron transport*. SIAM J. Sci. Comp. Vol. 29, No. 5.

Lee EJ, Manteuffel TA. 2007. *FOSLL\* method for the eddy current problem with three dimensional edge singularities*. SIAM J. Numer. Anal. Vol. 45: 787.

Brannick J, Brezina M, Livne O, Livshits I, MacLachlan S, Manteuffel T, McCormick S, Ruge J, Zikatanov L. 2007. *Adaptive smoothed aggregation in lattice*. Lecture Notes Comp. Sci. Eng. Springer Verlag Vol. 55: 505-512.

**Martinsson, Gunnar**

Liberty E, Woolfe F, Martinsson PG, Rokhlin V, Tygert M. 2007. *Randomized algorithms for the low-rank approximation of matrices*. Proceedings of the National Academy of Sciences Volume 104.

Martinsson PG, Rokhlin V. 2007. *A fast direct solver for scattering problems involving elongated structures*. Journal of Computational Physics Volume 221: 288-302.

Martinsson PG, Babuska I. 2007.

Radulescu A. 2007. *On complexity of quartic polynomials and the Connected Isentropes Conjecture*. Discrete and Continuous Dynamical Systems, Series B, 19 (1): 139-175.

Radulescu A. 2007. *Computing topological entropy in a space of quartic polynomials*. Journal of Statistical Physics 130 (2): 373-385.

### **Segur, Harvey**

Segur H. 2007. *Waves in shallow water, with emphasis on the tsunami of 2004*. **Tsunami and nonlinear waves**, ed. by Kundu A, Springer GeoSc: 3-30.

Segur H, Deconinck B, Kimura Y. 2007. *Finite-dimensional pole dynamics of solutions of the viscous Burgers equation*. J. Physics A:M 3.Tjo.Theor7(A, ). 40: 54597(267J/TT6.4 TD(Segur H. 20rveendequhe DM07. )Tj/TT8 1 Tf6.30992998TD[(T)91.ismoscun)]TJoleinstab

Rio de Janeiro, Brazil.

Ablowitz MA. 2007. *Dispersive shock waves*. In: International Conference: Partial Differential Equations; 2007 August 6.

Ablowitz MA (Organizer). 2007. Mini-Conference: Nonlinear Waves and ...More; 2007 August 15; Department of Applied Mathematics, University of Colorado at Boulder.

Ablowitz MA. 2007. *Pulses and dynamics in mode locked lasers*. In: AFOSR Workshop: Nonlinear Optics; 2007 September 25; University of Arizona.

### **Beylkin, Greg**

Beylkin G. 2007. *Toward Solving the Multiparticle Schrodinger Equation via an Unconstrained Sum of Slater Determinants*. 2007 January 25-26; Pacific Northwest National Laboratory, Richland, WA.

Beylkin G. 2007. *Fast algorithms for adaptive application of integral operators in high dimension*. 2007 February 2; University of North Carolina at Chapel Hill.

Beylkin G. 2007. *Fast algorithms for adaptive application of integral operators in high dimension*. In: The 2007 John H. Barrett Memorial Lectures; 2007 April 28.

IPAM Reunion II; *Nonlinear inversion of bandlimited Fourier transform and discrete transforms for bandlimited functions in a disk*, 2007 June 10-15.

Beylkin G. 2007. *Separated Representations and Nonlinear Approximations for Fast Algorithms in High Dimensions*. In: Minisymposium "Numerical multilinear algebra: a new beginning"; 2007 July 17; ICIAM, Zurich, Switzerland.

Beylkin G, Mohlenkamp MJ, Perez F. 2007. Preliminary results on approximating a wavefunction as an unconstrained sum of Slater determinants. In: Minisymposium "High-dimensional analysis meets scientific computing"; 2007 July 17; ICIAM, Zurich, Switzerland.

### **Bortz, David**

Bortz DM. 2007. Approximation Methods for Design and Control. 2007 March 7; Buenos Aires, Argentina.

Bortz DM. 2007. MBI Young Researchers; 2007 March 12; Columbus, OH.

Bortz DM. 2007. AMS Western Sectional Meeting; 2007 April 2; Tucson, AZ.

Bortz DM. 2007. Atlantic Coast Conf. on Math in the Life and Biol. Sciences; 2007 May 3; Blacksburg, VA.

Bortz DM. 2007. Colorado Center for AIDS Research; 2007 June 6; Denver, CO.

Bortz DM. 2007. Comp. and Math. Methods in Science and Engineering; 2007 June 20; Chicago, IL.

Bortz DM. 2007. Int'l Congress on Industrial and Applied Mathematics; 2007 July 19; Zurich, Switzerland.

Bortz DM. 2007. SMB Annual Meeting; 2007 August 1; San Jose, CA.

Bortz DM, Younger JG. 2007. In: Experimental Design and Model Selection, International Conference on Complexity in Acute Illness; 2007 October 7; Long Beach, CA.

Bortz DM. Math Modeling and Comp. Methods in Science and Engineering; 2007 October 23; Kobe, Japan.

## **Corcoran, Jem**

Corcoran J. 2007. *Efficient Graph Counting Techniques for MCMC Recovery of Bayesian Graphical Models*. In: Workshop on the Practice and Theory of Stochastic Simulation; October 22-26, 2007; Palo Alto, CA.

## **Fornberg, Bengt**

Fornberg B. 2007. Colloquium. University of Colorado at Boulder, Department of Applied Mathematics.

Fornberg B. 2007. Colloquium. University of Colorado at Boulder, Department of Psychology.

Fornberg B. 2007. Colloquium. Carnegie-Mellon University.

Fornberg B. 2007. Colloquium. UK Meteorological Office; Exeter, UK.

Fornberg B. 2007. In: 22nd Biennial Conference on Numerical Analysis; University of Dundee.

## **Julien, Keith**

Julien K. 2007. *Generalized Quasi-geostrophy for Spatially Anisotropic Rotationally Constrained Flows*. In: IPAM Workshops on Small Scales and Extreme Events: The Hurricane; 2007 February.

Julien K. 2007. *Generalized Quasi-geostrophy for Spatially Anisotropic Rotationally Constrained Flows*. In: CNLS seminar; 2007 March; Los Alamos National Laboratories.

Julien K. 2007. *Saturation of the MagnetoRotational Instability*. In: Astrophysical and Planetary Sciences (APS) Annual Division of Fluid Dynamics Meeting; 2007 November.

Julien K. 2007. *Generalized Quasi-geostrophy for Spatially Anisotropic Rotationally Constrained Flows*. In: SIAM Geosciences Workshops; 2007 March.

## **Li, Congming**

Li C. 2007. PDE Seminar. 2007 May; UC Davis, Department of Mathematics; Davis, California.

Li C. 2007. Colloquium. 2007 July; HeBei Normal University, Department of Mathematics; ShiJiaZhuang, Hebei, PRChina.

Li C. 2007. Colloquium . 2007 July; Capital Normal University, Department of Mathematics; Beijing, PRChina.

Li C. 2007. In: Workshop Lecture Series; 2007 July; TsingHua University, Department of Applied Mathematics; Beijing, China.

Li C. 2007. The International Conference on Partial Differential Equations and Their Numerical Analysis. 2007 Summer; HeNan Normal University, Department of Mathematics; XingXiang, Henan, PRChina.

Li C. 2007. *Recent progress on nonlinear elliptic and parabolic problems and related abstract methods*. In: Banff International Research Station for Mathematical Innovation and Discovery; 2007 Fall.

## **Lladser, Manuel**

Lladser M. 2007. *Minimal Markov chain embeddings of pattern problems*. In: Proceedings of the 2007 Information Theory and Applications Workshop; 2007 January 29 – February 2; University of California, San Diego.

Lladser M. 2007. 2007 Frontier Probability Days; 2007 May 21 – 22; University of Colorado, Colorado Springs,.

Lladser M. 2007. 2007 International Conference on Analysis of Algorithms; 2007 June 17 – 22; Juan-le-Pins, France.

Lladser M. 2007. *Session on Trees*. In: 32nd Conference on Stochastic Processes and their Applications; 2007 August 9; University of Illinois at Urbana-Champaign.

Lladser M. 2007. *Session on Simulation*. In: 32nd Conference on Stochastic Processes and their Applications; 2007 August 10; University of Illinois at Urbana-Champaign.

Lladser M. 2007. Discrete Mathematics Seminar. 2007 August 24; Universidad de Chile, Center of Mathematical Modeling.

Lladser M. 2007. Probability Seminar. 2007 August 29; Universidad de Chile, Center of Mathematical Modeling.

Lladser M. 2007. Combinatorics and Probability Seminar. 2007 September 11; University of Pennsylvania, Mathematics Department.

Lladser M. 2007. 2007 October 4; University of Illinois at Urbana-Champaign, ECE Department.

Lladser M. 2007. AMS Special Session on Algorithmic Probability and Combinatorics. 2007 October 6; DePaul University.

Lladser M. 2007. Dynamical Systems Seminar. 2007 October 11; University of Colorado at Boulder, Department of Applied Mathematics.

Lladser M. 2007. CO/WY American Statistical Association, Fall Meeting; 2007 October 26.

### **Manteuffel, Tom**

Manteuffel T. 2007. Distinguished Lecture Series. 2007 April 3; University of Illinois, Computer Science Department.

Manteuffel T. 2007. Plenary Address. In: DOE Workshop on Recent Advances in System Solvers; 2007 May 23; Livermore, CA.

Manteuffel T. 2007. Department Colloquium. 2007 November 8; Penn. State University, Department of Mathematics.

### **Martinsson, Gunnar**

Martinsson G. 2007. *Randomized algorithms and fast direct solvers*. In: Numerical analysis seminar; 2007 March; University of Texas at Austin.

Martinsson G. 2007. *Rapid evaluation of electrostatic interactions in multi-phase media*. In: International Congress of Industrial and Applied Mathematics; 2007 July; Zurich.

Martinsson G. 2007. *Two randomized methods for the approximation of matrices*. In: International Congress of Industrial and Applied Mathematics; 2007 July; Zurich.

Martinsson G. 2007. *Fast direct solvers*. In: International Congress of Industrial and Applied Mathematics; 2007 July; Zurich.

Martinsson G. 2007. *Randomized methods for the approximation of matrices*. 2007 September; Institute for Pure and Applied Mathematics.

Martinsson G. 2007.



Martinsson G. 2007. *Approximation of structured matrices via randomized sampling*. In: Lake Arrowhead workshop; 2007 December; organized by the Institute for Pure and Applied Mathematics at UCLA.

### **Meiss, Jim**

Meiss JD. 2007. *Dynamics of 3D Volume-Preserving Maps*. In: MRSI; 2007 January 25; Berkeley.

Meiss JD. 2007. *Chaotic Dynamics in Volume Preserving Maps*. In: Mathematics Colloquium; 2007 March 23.

Meiss JD. 2007. *Twistless Bifurcations in Volume Preserving Maps*. In: SIAM Dynamical Systems Meeting; 2007 May 28; Snowbird, UT.

Meiss JD. 2007. *Bifurcations of Invariant Circles for Volume Preserving Maps*. In: Perspectives in Nonlinear Dynamics PNLD 2007; 2007 July 17; Int. Center for Theoretical Physics, Trieste.

Meiss JD. 2007. *Visualization of Dynamics: Two to Four Dimensional Maps*. In: Perspectives in Nonlinear Dynamics PNLD 2007; 2007 July 17; Int. Center for Theoretical Physics, Trieste.

Meiss JD. 2007. *Tori and Invariant Circles for Volume Preserving Maps, Nonlinear Dynamics and Chaos: Advances and Perspectives*. 2007 September 21; Univ. of Aberdeen, Scotland.

Meiss JD. 2007. *Transport and Lobes for Volume Preserving Maps*. In: Amer. Math. Society Meeting; 2007 October 5; De Paul University.

Meiss JD. 2007. *Bifurcations of Invariant Circles, Mathematics: Analysis, Modeling, Optimization and Simulation*. 2007 October 18; University of Texas at Austin.

Meiss JD. 2007. *Volume Preserving Maps*. In: Joint Math/Physics Dynamical Systems Seminar; 2007 October 25; Univ. of Texas at Austin.

Meiss JD. 2007. *Normal Forms and Bifurcations for Volume Preserving Maps*. In: Mathematics Colloquium; 2007 November 13; Imperial College London,.

Meiss JD. 2007. *Hopf and Neimark Sacker Bifurcations for Piecewise Smooth Dynamical Systems*. In: Engineering Mathematics Colloquium; 2007 November 14; Univ. of Bristol,.

Meiss JD. 2007. *Bifurcations of Invariant Circles for Volume Preserving Maps*. In: Mathematics Seminar; 2007 November 21; Loughborough Univ.

### **Nelson, Mary**

Nelson M, Geist MR, Miller RL, Streveler RA, Olds BM. 2007. *How to Create a Concept Inventory: The Thermal and Transport Concept Inventory*. In: Annual ASEE Conference; 2007 June.

Nelson MA. 2007. *Oral Assessments in Calculus I: Improvement in Understanding, Grades and Retention*. In: Annual meeting of American Educational Research Association (AERA); 2007 April; Chicago, IL.

Nelson MA, Geist MR, Miller RL, Streveler RA, Olds BM. 2007. *How to Create a Concept Inventory: The Thermal and Transport Concept Inventory*. In: Annual meeting of American Educational Research Association (AERA); 2007 April; Chicago, IL.

Nelson MA. 2007. *The Implementation of the STEM Colorado Grant in the Applied Mathematics Department*. In: Joint Mathematics Meeting; 2007 January; New Orleans, LA.

Nelson MA. 2007. *How Research Can Improve Teaching and Learning*. In: *Graduate Teaching Program*; 2007 March 8.

Nelson MA. 2007. *The effect of oral assessments on learning*. In: Creativity in Teaching Workshop organized by the engineering lead TAs; 2007 March 14.

## **Radulescu, Anca**

Radulescu A. 2007. *Hebbian inspecificity in unsupervised learning*. In: Computational and Systems Neuroscience annual meeting; Salt Lake City, UT.

Radulescu A. 2007. *A systems approach to schizophrenia*. In: Mt. Sinai International Congress on Schizophrenia Research; Colorado Springs, CO.

Radulescu A. 2007. *A systems approach to schizophrenia*. In: 8th International Conference on Systems Biology; Long Beach, CA.

Radulescu A. 2007. *Schizophrenia – a parameters' game?* In: Coleman Institute and RERC Annual Meeting; Westminster, CO.

Radulescu A. 2007. *A dynamics model of schizophrenia*. In: Seminar presentation; Boston University; MA.

Radulescu A. 2007. *A time-series analysis of complexity and attractor dimension*. In: Seminar presentation; University of Colorado at Boulder, Department of Applied Mathematics.

Radulescu A. 2007. *A dynamical systems theoretical model of schizophrenia*. In: Seminar presentation; University of Colorado at Boulder, Psychology Department.

## **Segur, Harvey**

Segur H. 2007. *Stable wave patterns of nearly permanent form on deep water*. 2007 February 14; Department of Physics, Tokyo University; Japan.

Segur H. 2007. *Stabilizing the Benjamin-Feir instability*. 2007 March 28; Department of Mathematics, University of Buffalo; NY.

Segur H. 2007.

# Outreach

*Outreach activities help to share the knowledge and enthusiasm of the Department with others. The outreach efforts of the Department are an extension of its mission to provide education and training in applied mathematics. These efforts are focused in two areas: professional development for secondary math teachers and mathematical encouragement and enrichment for high school students.*

## **Boulder Partnership for Excellence in Mathematics Education Continues in Second Year**

Applied Mathematics is in its second year of a three-year collaboration with Boulder Valley School District (BVSD), The University of Colorado's School of Education, and the Freudenthal Institute. This collaboration is called the Boulder Partnership for Excellence in Mathematics Education and is funded by a grant from the Colorado Department of Education. The goals of this project include significant improvement in mathematical achievement among low-income and minority population groups in grades 6-8. The project involves two-week summer workshops and monthly half-day training sessions for participating middle school math teachers in BVSD. The Department hopes that this project will form the foundation for additional collaborations with area school districts. Mary Nelson and Anne Dougherty will lead the effort from the Department.

## **Department of Applied Mathematics Sponsors Colorado Math Circle**

The Department of Applied Mathematics sponsors monthly meetings of Colorado Math Circle (CMC) in order to address the needs of primary and secondary students. These meetings are held in the University of Colorado Engineering Center. They typically feature lectures by professors and mathematicians from around the state. Topics range from number theory and combinatorics to probability, geometry, and game theory.

Interest in CMC has grown steadily since its inception, and the average monthly attendance has increased by approximately 80% from 2004 to 2007.

Along with the monthly lectures, students participate in competitions. The competitions include a weekend of activities that are sponsored by the American Regions Math League (ARML) and bring together the nation's top mathematics students. In 2007 the ARML activities involved more than 100 fifteen-member teams from nearly 52ad baSpt

# Faculty Service to the University, Department, and Societies

## **Ablowitz, Mark**

Served upon: Department of Applied Mathematics undergraduate committee.

Chaired: faculty review committee: P. Martinsson (Assistant Professor--comprehensive review).

Chaired: faculty review committee: K. Julien (Promotion to Professor).

Chaired: Chemistry Department Internal Review Committee.

Chaired: Task force discussing the possibility of beginning a graduate school interdisciplinary effort in computational science and engineering.

## **Bortz, David**

Organizer: minisymposium, "Future Directions in PDE Simulations," at ICIAM in Zurich, Switzerland.

Consultant: Immunetrics (computational design of pharmaceuticals) (2007 January).

Served upon: Department of Applied Mathematics Undergraduate committee.

Served upon: Statistics/Applied probability search committee.

Peer review: one article for IEEE Transactions on Biomedical Engineering.

Peer review: one article for Journal of Critical Care.

Peer review: two articles for Journal of Theoretical Biology.

Peer review: one article for Mathematics and Computers in Simulation.

Participated: LEAP workshop 2007 May.

## **Corcoran, Jem**

Served upon: graduate committee, Spring 2007,

Served upon: undergraduate committee, Fall 2007.

## **Curry, Jim**

Chair: Department of Applied Mathematics.

Trustee: University of Colorado Foundation.

Served upon: Selection committee for the AMS Frank and Brennie Morgan Prize for outstanding Research in Mathematics by an undergraduate Student (SIAM representative - term ends in 2011).

Managed: Afro-Americans in the Mathematical Sciences listserv.

Served upon: American Mathematical Society Committee on the Profession (2006- 2009).

Served upon: SIAM Education Committee.

Served upon: National Research Council Fellowships Office Advisory Committee (2006-2009).

Served upon: Vietnam Education Foundation (VEF) prospective graduate evaluation committee (14 days in Vietnam, 2007 August 1 to August 14).

Served upon: Editorial Board of SIAM Undergraduate Research Online Journal.

Served upon: Ford Foundation Diversity Fellowship Committee.

Served upon: National Center for Atmospheric Research (NCAR), Institute for Mathematics Applied to the Geosciences (IMAGE) Advisory Committee, 2006-present.

Served upon: National Science Foundation External Review Panel, for VIGRE II. (Rice University, 2007 November 19).

Served upon: Primary Unit Evaluation Committee, UCB School of Education.

Served upon: Primary Unit Evaluation Committee, UCB School of Law.

### **Dougherty, Anne**

Associate Chair: Department of Applied Mathematics (2000 July 1 to present).

Faculty advisor (Spring 2007) for the University of Colorado at Boulder SIAM undergraduate chapter.

Served upon: Applied Mathematics Probability and Statistics Prelim Committee (2007 January).

Chaired: Applied Mathematics Undergraduate Committee.

Organized: Department of Applied Mathematics presentation for the College of Engineering's High School Honors Institute, Explore Engineering for Admitted Students, Engineering Orientation, Engineering Open House, WIEP and MEP Senior Day Event.

Contributor: CU Engineering, 2007 magazine.

Representative to: Undergraduate Education Council in the College of Engineering.

Served upon: Honors Subcommittee.

Served upon: Actuarial Studies and Quantitative Finance Certificate Program Committee.

University of Colorado at Boulder Representative to: Goldwater Scholarship.

Coordinated: Department of Applied Mathematics online tutoring, Spring 2007.

Contributor: Boulder Partnership for Excellence in Mathematics Education.

Co-PI (with Congming Li and Silva Chang) on award from the CU-Boulder Outreach Committee to partially fund the Colorado Math Circle. One award was received for AY 2006-2007. A second award was received for AY 2007-2008.

### **Fornberg, Bengt**

Chair: Colloquium Committee (Spring 2007).

Acted as a contact person between the Department of Applied Mathematics and two Korean universities, Kyungpook and Chonnam National Universities, in establishing departmental collaborative agreements under the BK21 Korean government education initiative.

Served upon: The University of Colorado Innovative Grant Program (IGP) review panel (Physical sciences / Engineering panel).

Reviewed: proposals for NSF and its counterparts in some other countries.

Reviewed: about 20 articles during the year for various journals and book publishers.

### **Julien, Keith**

Co-director: National Center for Atmospheric Research (NCAR), Institute for Mathematics Applied to the Geosciences (IMAGe) 2008 Theme of Year.

Associate Chair: Applied Mathematics Graduate Program.

Served upon: Arts and Science Committee.

Served upon: Arts and Science Budget Committee.

Reviewer: Journal of Fluid Dynamics.

Reviewer: Physics of Fluids article.

### **Li, Congming**

Primary Unit Evaluation Committee for Dr. Mary Nelson's reappointment as instructor.

Chair: Prelim for Applied Analysis.

Member: Grievance Committee, Council of the College of Arts and Sciences.

Editor of: Communication on Pure and Applied Analysis. Handles many manuscripts as an editor as well as a reviewer.

Peer reviews: Two articles for Pacific Journal of Mathematics.

Peer reviews: Three articles for Journal of Differential Equations.

Peer reviews: Articles for Discrete and Continuous Dynamical Systems.

Peer reviews: One article for Mathematical Research Letters.

Peer reviews: Two articles for Communications on Pure and Applied Mathematics.

Peer reviews: Articles for Proceedings of the AMS.

Advising and Lecturing: 'Colorado Math Circle for Advanced High School Students' in mathematics.

### **Lladser, Manuel**

Peer Evaluation of Staff Performance: Susan Pryor (Department of Applied Mathematics, University of Colorado at Boulder, Fall 2007).

Served upon: Spring/Fall 2007, Probability and Statistics Search Committee.

Assisted in potential faculty recruitment: Juan G. Restrepo (two-body problem), Divya E. Vernery (two-body problem), and the IBG candidates: Kwang-Young Kim, Tiejun Tong, and Wei-Min Chen (Fall 2007).



**McCormick, Stephen**

Served upon: Graduate Committee.

Served upon: Ad Hoc Executive Committee.

Served upon: Primary Unit Evaluation Committee.

Reviewer: NSF and DOE proposals.

Reviewer: SISC.

Reviewer: SINUM.

Reviewer: J. Comp. Physics.

Reviewer: AMS Reviews.

Reviewer: Zentralblatt.

Organizing Committee, 13th Copper Mountain Conference on Multigrid Methods, Copper Mountain, Colorado, March 18-23.

Chair, AMG Summit, Lake City, CO, September 16-23.

Co-Organizer of the 13th Copper Mountain Conference on Multigrid Methods, Copper Mountain, Colorado. Funded by DOE, NSF, and IBM.

Chair of the AMG Summit, Lake City, CO. Funded by LLNL.

**Meiss, Jim**

Reviewer: Book Manuscript for Princeton University Press.

Served Upon: Comprehensive Exam Committee, Seth Claudempierre, PhD Student, Applied Mathematics.

Fellow: Center for Integrated Plasma Studies.

Served Upon: Honors Thesis Committee for Shawn Baland, Dept. of Mathematics.

Reviewer: Physica D.

Reviewer: Nonlinearity.

Reviewer: Physical Review Letters.

Reviewer: Chaos (AIP Journal).

Reviewer: Discrete and Continuous Dynamical Systems.

Reviewer: Journal of Nonlinear Science.

Reviewer: Physical Review E.

Reviewer: NSF proposal for the Division of Mathematical Sciences (2007 February).

Reviewer: Physics Letters A.



**Melara, Luis**

Co-advisor: SIAM Undergraduate Chapter (Fall 2007).

**Nelson, Mary**

Chaired: Defense Agency Committee on Women in the Services (DACOWITS).

Supervised: project to create and test concept questions to be used by Calculus I instructors as clicker questions.

Thesis advisor: Nathan Balk (BS/MS, May 2007).

Co-supervised: Work of two Department of Applied Mathematics Noyce fellows, Matt Rugierro and Nathan Balk, who are writing a, "clicker book," which also describes the transformations taking place in the Applied Mathematics Department. Contributed a chapter in above, "clicker book,"

Organized/Contributed: Oral assessments and questions for all Calculus II students (offered to 450+ students).

Organized/Contributed: Oral assessments and questions for all Calculus I students (offered to 600+ students).

Organized and Conducted: Mock oral assessments for all APPM 1350 instructors and teaching assistants and other interested individuals in order to help explain how orals for APPM 1350 should be conducted.

Trained: Oral assessment facilitators.

Supervised: Noyce fellows, Kate Spooner, and Amanda Geist.

Coordinated: APPM 1340 (Fall 2007), APPM 1345 (Spring 2007), APPM 1360 (Spring 2007).

Supported: The Colorado LAtest effort; counseling prospective K-12 mathematics teachers, supervising the work of Department of Applied Mathematics learning assistants and assisting in the transformation of classes in Applied Mathematics.

Supported: LAtest grant on the Boulder campus. Met every other week with DBER (Discipline Based Educational Research) faculty from Physics, Chemistry, Astronomy, Applied Mathematics, Geology and Education. Assisted the K-12 tier of the grant.

Served upon: Steering committee denied: s fLer internd Conducted: Mock oral assessments for all APPM 1350 instructors and teacouke

**Norris, Adam**

Recruited/Organized: Hired exam graders for APPM 1350, 1360, 2350 and 2360.

Collected and Distributed: Special needs exams for all scheduled exams for APPM 1350, 1360, 2350 and 2360.

Organized: Proctoring of the special needs exam room for APPM 1350, 1360, 2350 and 2360.

Served Upon: Member of the Department of Applied Mathematics Undergraduate Committee.

Participated: Interview, selection, and coordination of the activities of the Department of Applied Mathematics Learning Assistants.

Outreach: Alexander Dawson School Visit, organized and presented an activity station on bio-mechanics of human motion.

Coordinator: Calculus III lectures (Spring 2007 and Fall 2007).

Faculty Advisor: Theta Tau (a professional engineering fraternity).

Represented: The Department of Applied Mathematics for Explore CU Engineering, through presentations and activities illustrating the use of mathematics to solve real-world problems.

Represented: The Department of Applied Mathematics for High School Honors Institute, by preparing and presenting activities illustrating the mathematical modeling of mechanical systems and bio-mechanical systems.

Represented: The Department of Applied Mathematics for Engineering Open House, through presentations and activities illustrating the use of infinite world problems.

Reviewer: Fluid Dynamics Research.

Reviewer: Physical Review Letters.

Reviewer: Physics Letters A.

Reviewer: Wave Motion.

Reviewer: International Offshore and Polar Eng. Conf.

**Tong, Tiejun**

Reviewer: The Australian and New Zealand Journal of Statistics.

Reviewer: Computational Statistics and Data Analysis.

Reviewer: Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences.

Reviewer: Chapter in "Frontiers in Biostatistics and Bioinformatics", USTC Press.

# Teaching Activities

## Undergraduate Courses Taught by Department Faculty

### SPRING 2007

Course Number	Instructor	Course Title
APPM 1345	Byrne, Nelson	Calculus 1B w/ Algebra
APPM 1350	Prentice, Radulescu	Calculus 1 for Engineers
APPM 1360	Horikis, Nelson, Radulescu, Tearle	Calculus 2 for Engineers
APPM 2350	Mayhew, Norris	Calculus 3 for Engineers
APPM 2360	Bortz, Heuett, Lee	Differential Equations w/ Linear Algebra
APPM 2450	Reynolds, Schmitt	Calculus 3 Lab
APPM 2460	Biagioni, Hammond, Robinson	Differential Equations Lab
APPM 2750	Bishop	Java 2
APPM 3050	Tearle	Scientific Computing in Matlab
APPM 3310	Dougherty	Matrix Methods
APPM 3570	Lladser	Applied Probability
APPM 4120/5120	Hallowell	Operations Research
APPM 4360/5360	Fornberg	Complex Variables
APPM 4520/5520	Rider	Intro to Mathematical Statistics
APPM 4540/5540	Kuznetsov	Intro to Time Series
APPM 4570/5570	Heuett	Statistical Methods
APPM 4580/5580	Luftig	Statistical Methods Data
APPM 4650	Fox	Intro to Numerical Analysis 1
APPM 4660	Norris	Intro to Numerical Analysis 2
APPM 4720/5720	Hughson	Mathematical Finance
APPM 4720/5720	Kim	Numerical Linear Algebra
APPM 4950	Bishop	Seminar in Applied Mathematics
APPM 4950	Dougherty	Wavelets
GEEN 1350	Bousquet	Calculus 1 Workgroup
GEEN 1360	Grooms	Calculus 2 Workgroup
HONR 1001	Dougherty	Calculus 3 and Differential Equations

### SUMMER 2007

Course Number	Instructor	Course Title
APPM 1350	Balk	Calculus 1 for Engineers
APPM 1360	Grooms	Calculus 2 for Engineers
APPM 2350	Girard, Mayhew	Calculus 3 for Engineers
APPM 2360	Byrne, Nixon	Differential Equations w/ Linear Algebra
APPM 2450	Reynolds	Calculus 3 Lab
APPM 2460	Hammond	Differential Equations Lab
APPM 3310	Radulescu	Matrix Methods
APPM 4650	Norris	Intro to Numerical Analysis 1

**FALL 2007****Course Number****Instructor****Course Title**

APPM 1340	Melara, Nelson	Calculus 1A w/ Algebra
APPM 1350	Melara, Nelson, Radulescu, Segur	Calculus 1 for Engineers
APPM 1360	Dougherty, Li	Calculus 2 for Engineers
APPM 2350	Herzfeld, Norris	Calculus 3 for Engineers
APPM 2360	Horkis, Julien, Prinari	Differential Equations w/ Linear Algebra
APPM 2450	Reynolds	Calculus 3 Lab
APPM 2460	Hammond, Nixon	Differential Equations Lab
APPM 3010	Radulescu	Intro to Nonlinear/Chaos
APPM 3310	Beylkin, Dougherty	Matrix Methods
APPM 4350/5350	Ablowitz	Methods in Applied Math 1: Fourier Series
APPM 4520/5520	Tong	Intro to Math Statistics
APPM 4560/5560	Corcoran	Markov Processes
APPM 4570/5570	Corcoran	Statistical Methods
APPM 4650	Norris	Intro to Numerical Analysis 1

# Graduate Courses Taught by Department Faculty

## SPRING 2007

<b>Course Number</b>	<b>Instructor</b>	<b>Course Title</b>
APPM 5450	Martinson	Applied Analysis 2
APPM 5480	Segur	Approximation Methods
APPM 5610	Beylkin	Numerical Analysis 2
APPM 6640	McCormick	Multigrid Methods
APPM 6900	Corcoran	Independent Study
APPM 7400	Fornberg	Radial Basis Functions
APPM 7400	Maier	Software Tools/Comp. Sci. and Engineering
APPM 7400	Lladser	Advanced Probability
APPM 8000	Fornberg	Colloquium
APPM 8100	Ablowitz	Seminar in Nonlinear Waves
APPM 8600	McCormick	Seminar in Computational Math

## FALL 2007

<b>Course Number</b>	<b>Instructor</b>	<b>Course Title</b>
APPM 5440	Manteuffel	Applied Analysis 1
APPM 5470	Curry	Methods of Applied Mathematics 3: PDE's
APPM 5600	McCormick	Numerical Analysis 1
APPM 6610	Manteuffel	Numerical Partial Differential Equations
APPM 7400	Anne Dougherty	Teaching Exc
APPM 7400	Luftig	Advanced Topics in Statistics
APPM 8000	Tom Manteuffel	Colloquium
APPM 8100	Jim Meiss	Seminar in Dynamical Systems
APPM 8100	Mark Ablowitz	Seminar in Nonlinear Waves
APPM 8600	McCormick	Seminar in Computational Math





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