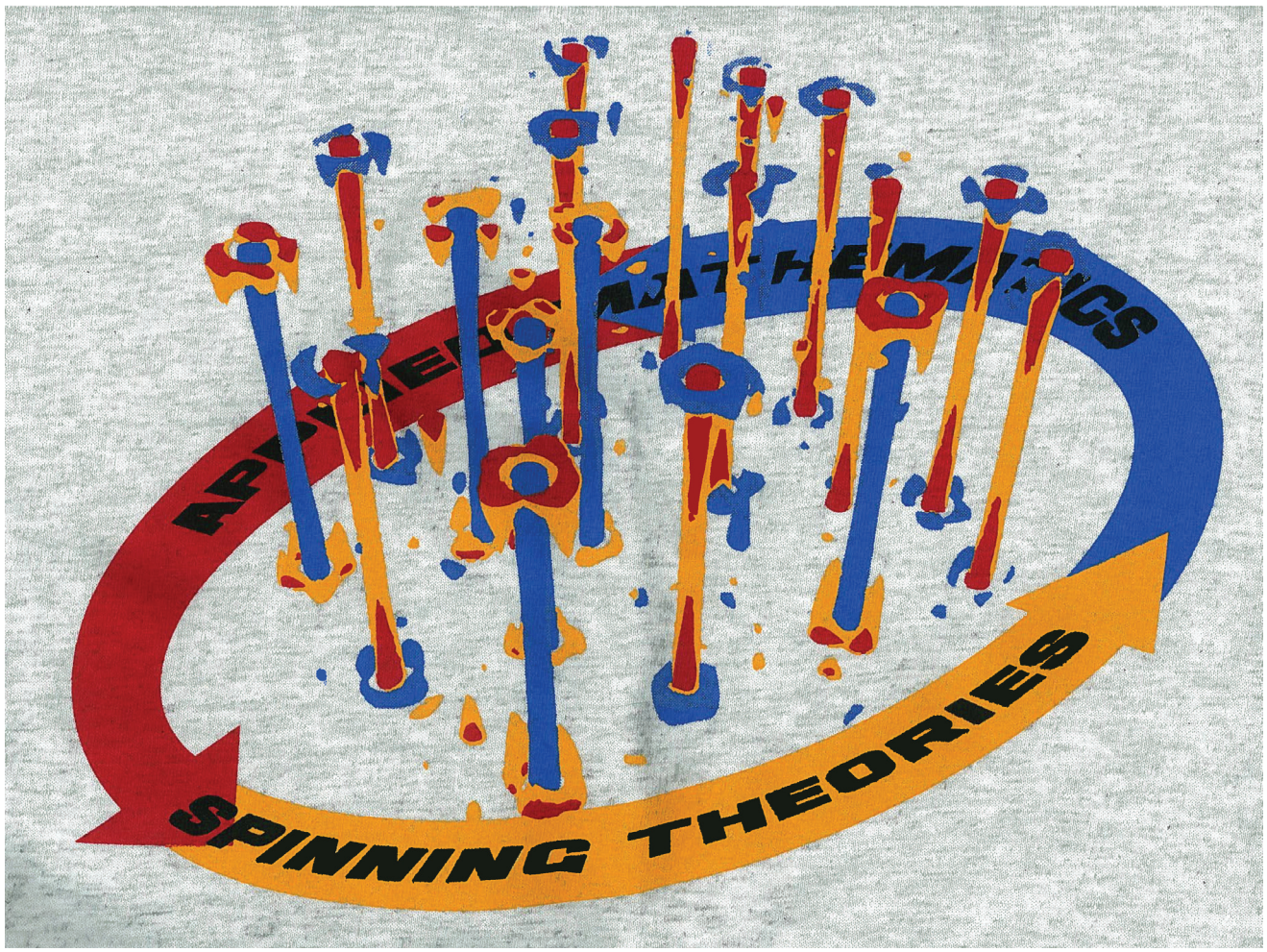
Department of Applied Mathematics

Annual Report 2010



Colorado
University of Colorado at Boulder

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 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.*

Cover Art

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. This year's design comes from Dr. Keith Julien. Dr. Julien's research is in the dynamics and instability processes in geophysical and astrophysical fluid dynamics..

Department of Applied Mathematics 2010 Annual Report
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Department of Applied Mathematics 2010 Annual Report Overview

The Department of Applied Mathematics focuses on strategies and maintains 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 has shown that the question is not whether mathematics will be applied – the only question is where and when!

Our mission has changed little 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. We continue to seek new methods to continue the growth in enrollment we have seen across all our degrees over the last ten years.

An Applied Mathematics degree is an extremely flexible technical degree. A consequence of this flexibility is that the Department is constantly on the look out for new areas of engagement or new areas to apply mathematics. Our game development curriculum continue to grow and shows no signs of stopping, and Applied Mathematics will keep contributing high value and new ideas. The Department has begun recruiting faculty with expertise in statistics, as we move forward into development of our statistics track. Concurrently, we are at the vanguard of the University's developing mathematical biology program.

As noted in the past, the Department has a very distinguished faculty at all ranks. Department faculty include a former president of the world's largest Society of Industrial and Applied Mathematicians, faculty who are among the most highly cited for their research publications, recipients of outstanding student advisor awards, and numerous distinctions and awards for excellence in teaching.

The Department of Applied Mathematics at the University of Colorado at Boulder has moved from strength to strength with its excellent faculty and excellent students. With its Vision, Mission, and Goals will not only participate in shaping the future, but also continue to develop and produce excellent scholar-students, excellent research, and excellent service to the State and the Nation. The best is yet to come. "Do more Math!"

Dr. James H. Curry
Department Chair

Dr. Anne Dougherty
Associate Chair

Department of Applied Mathematics 2010 Annual Report
Departmental Activities

Undergraduate Education

Anne Dougherty continued to serve the department as Chair of Undergraduate Studies. The Undergraduate Committee consisted of Gregory Beylkin, David M. Bortz, Manuel Lladser, and Adam Norris.

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 over seven thousand undergraduate and graduate students in 2010. See p. 40 for a detailed list of the courses taught. Applied Mathematics had 130 undergraduate Applied Mathematics majors in 2010.

35 students received their baccalaureate degrees this year. (See p. 10 for a list of our graduates.) Our minor program, attracting students from other majors who are interested in more in-depth training in applied mathematics continues to grow steadily. 67 students had an Applied Math minor in 2010, and more are taking at least some of the upper division courses towards it.

Undergraduate Chair Anne Dougherty is responsible for nominating students for the annual Goldwater Scholarship award. Four CU undergraduate students, majoring in science, math or engineering, are selected each year for the national competition. In spring 2010, Engineering Physics major Kevin Fiedler received the Goldwater scholarship for the 2010-2011 academic year. The other three nominated students (Marshall Carpenter (AMEN), Vicki Hsu (ASEN), and Samantha Jo Johnson (CHEN) each received Honorable Mention.

The department saw a slight dip in course enrollment in 2010, less than 5%. The university as a whole saw a decline in new student enrollment in 2010, so a drop in lower division course enrollment was to be expected. Even with such a dip, Applied Mathematics taught over 3,000 students per semester, for more than 14,000 credit hours in 2010. The department managed this with only five full time instructors and two lecturers.

Just as last year, the department ran two undergraduate seminars. The first, the *Early Identification Seminar*, continues the department's effort to get students up to speed as new students to the university and majors in Applied Mathematics. This is a calculus-based seminar run by Co-PI Anne Dougherty. The second, colloquiually named *The Ants Seminar* (APPM 4720), was spontaneously requested and developed by students in the Engineering Honors Program. A goal of The Ants Seminar was to model, using simple rules, the behavior of colonies of ants. Additionally, the department offered an *Introduction to Analysis* course whose goal is to prepare undergraduate students better for the critical transition into the department's graduate course offerings. That course has been well received by majors and enrolled 35 students in Fall 2010. This is a very positive indicator for future enrollments in the Applied Math major.

Graduate Education

Jim Meiss served as the department's Graduate Committee Chair. The Graduate Committee consisted of Bengt Fornberg, Juan Restrepo and Tiejun Tong.

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, and 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. A graduate student in Applied Mathematics can pursue a doctorate in Applied Mathematics with an affiliated faculty member as the thesis advisor, along with an Applied Mathematics co-advisor. A basic goal of this department is to seek out and develop new areas of application for mathematics and our affiliated faculty members play a crucial role in that process.

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

- 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.

- 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.

- **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

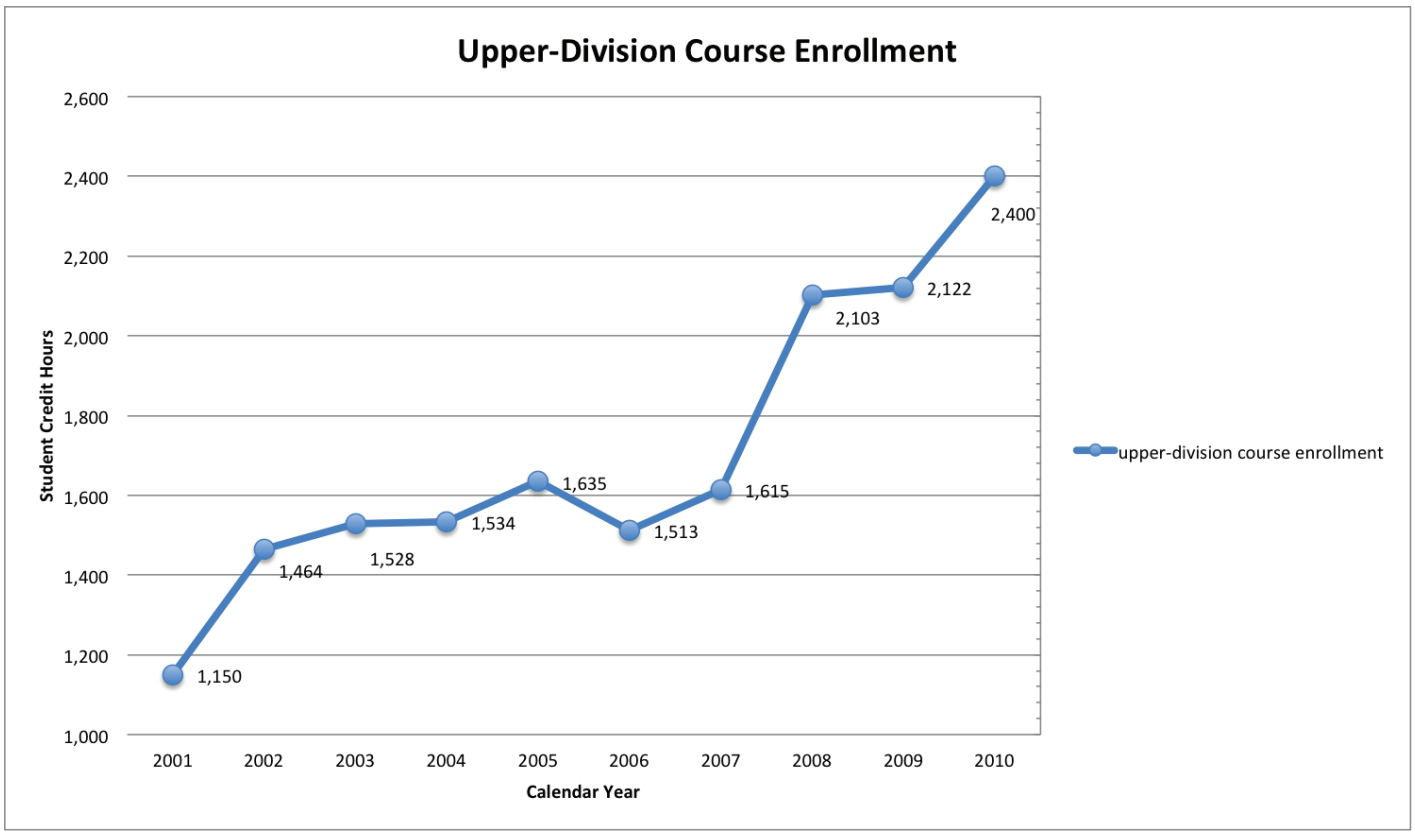
Enrollment Statistics

Year	Total Number of Enrolled Students in all APPM Courses	Number of Enrolled Graduate Students (MS/PhD)	Number of Enrolled Undergraduate Majors	Number of Enrolled Undergraduate Minors
2001	5,435	22/57	66	29
2002	5,899	28/55	67	34
2003	6,127	39/54	85	37
2004	6,443	35/60	90	42
2005	6,342	31/54	105	48
2006	6,358	28/50	120	65
2007	6,746	32/55	110	63
2008	6,775	26/52	119	64
2009	7,428	37/48	127	69
2010	7,179	20/65	130	66

Undergraduate major enrollment continues its inexorable climb, even as total enrollment in APPM courses dips slightly. APPM saw slightly fewer enrolled minors in 2010, but not a significant drop. APPM appears to be reaching a plateau in terms of undergraduate students it can reasonably instruct with our current faculty size.

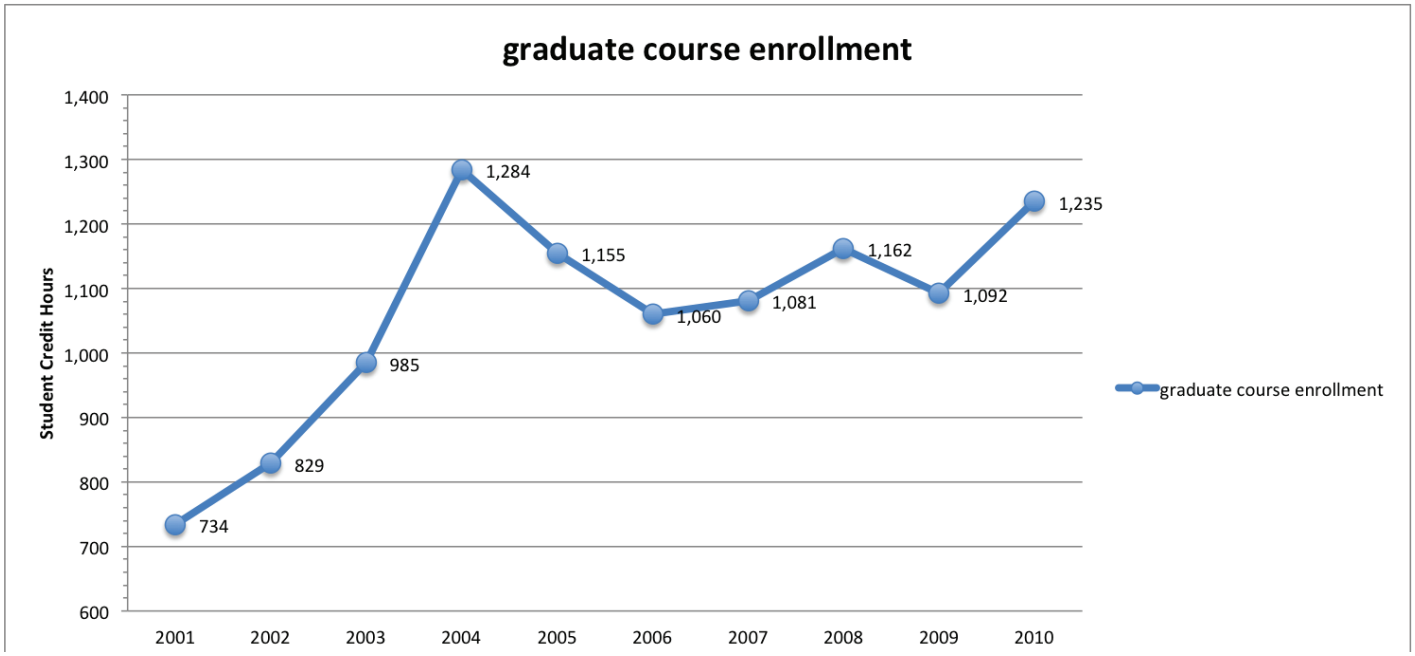
The dramatic upturn in PhD enrollment can partially be attributed to many of our Master's candidates making the decision to pursue a PhD during their tenure in our program. In addition to our normal recruitment, fifteen of our 2009 Master's Candidates became PhD candidates in 2010. This same change in program explains the equally dramatic downturn in Master's enrollement.

Undergraduate Enrolled Upper-Division Student Credit Hours



In 2010, Applied Mathematics saw its largest jump in enrollment since 2007, teaching nearly 300 upper division credit hours more than it did in 2009. Despite increasing numbers of students and courses to be taught, the number of Applied Mathematics faculty has remained relatively flat. It is a tribute to the quality and dedication of the department's faculty that CU Applied Mathematics retains its high caliber in the face of this increasing workload.

Graduate Enrolled Credit Hours



Graduate enrollment in Applied Mathematics almost reached its 2004 peak, falling short by only 49 student credit hours. The department is excited about the future of its graduate program, and expects record enrollment for 2011.

Faculty Awards and Honors

Mark Ablowitz was listed by ISI Web of Science as one of the most frequently cited people in the field of Mathematics. According to ISI, in 2010 his papers were cited over four hundred times.

Anne Dougherty won the Boulder Faculty Assembly Excellence in Service Award. Mary Nelson won the Boulder Faculty Assembly Excellence in Teaching Award. The Chancellor provides funds for these prestigious awards. Recipients were granted $3,000 and were honored by colleagues, family and friends at a reception at the end of March.

The Chicago Tribune published an article about **Vanja Dukic**'s research on tracking epidemics.

Per-Gunnar Martinsson was awarded a College Scholar Award. This award is selected by the College of Arts & Sciences Professors of Distinction, intended to acknowledge scholarship, creative accomplishment, and promise. Dr. Martinsson and his work were deemed especially meritorious, and the College invested some of its gift dollars so that he may enjoy a semester free from formal classroom responsibilities in order to further your professional work.

Steve McCormick was selected as a 2010 SIAM Fellow. This honorary distinction acknowledges nominated and selected members of the SIAM community as leading thinkers and ambassadors of applied mathematics and computational science.

Department of Applied Mathematics 2010 Annual Report
Graduating Students

May

Bachelor's Degrees

Trevor Aeschliman
Markus Atkinson
Eric Benzel
Garrett R. Clark
Vladimir Dubovskiy
Daniel D. Edwards
Rachel Fahrenholtz
Daniel C. Heffron
Anna M. Lieb
David B. Miller
Kirk Nichols
Luke Pederson
Amber Roche
Melissa Spicer
Tiana Stastny
Jack Tatum
Amy Van Hove
Carrie Weidner
Nicholas Weinreich
Colin G. West
Tyler Yahn

Master's Degrees

Joseph F. Adams (BS/MS)
Yuanting Chen
Theodore Galanthay
Beth Hegland
Eason Jostad
Lenton McLendon
Geoffrey Peterson (BS/MS)
Ryan Schilt (BS/MS)
Sebastian Skardal
Kristine Snyder
John Villavert
Patrick Yannul

Doctoral Degrees

Jinyu Li

August

Bachelor's Degrees

Eric Greenwald
Matanya Horowitz
Benjamin Palin
Timothy Schiesswohl

Master's Degrees

Stephen Chestnut
Jerrad Hampton

December

Bachelor's Degrees

Ryan C. Brown
James Caine
Andrew S. Erickson
Toni Klopfenstein
David B. Miller
Christopher Morroni
Margaret A. Noble
Emily Schuck
Jacob D. Smith
Aaron Stockton

Master's Degrees

Jason DeSalvo
Adam Fox
Nathan Halko
Owen Lewis

Doctoral Degrees

Min Ho Park
Lei Tang
Patrick Young

Department of Applied Mathematics 2010 Annual Report
Faculty, Instructors, Research Associates, Visitors, and Staff

Core Faculty, Instructors, and Research Associates

Mark J. Ablowitz – Professor; College of Arts and Sciences Professor of Distinction; PhD, Massachusetts Institute of Technology. *Partial Differential Equations, Solutions, Nonlinear Waves.*

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

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

Sujeet Bhat – Instructor; PhD, University of Florida. *Partial Differential Equations, Numerical Analysis, Graph Theory.*

David Bortz – Assistant Professor; Ph.D, North Carolina State University. *Biological Systems.*

Marian Brezina – 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 – Department Chair; Professor; J. R. Woodhull Logicon Teaching Professor of Applied Mathematics; PhD, University of California at Berkeley. *Dynamical Systems, Numerical Methods, Nonlinear Equations.*

Christopher Curtis – Instructor; PhD, University of Washington. *Computational Mathematics.*

Anne Dougherty – Associate Department Chair; Chair of Undergraduate Studies: Senior Instructor; PhD, University of Wisconsin, Madison. *Applied Probability, Stochastic Processes.*

Vanja Dukic – Associate Professor; PhD, Brown University. *Biostatistics.*

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.*

Monica Geist - Professional Research Associate; PhD, University of Northern Colorado

Keith Julien – Chair of Graduate Studies; Associate Professor; PhD, Cambridge University, United Kingdom. *Mathematical and Computational Fluid Dynamics, Dynamical Systems Theory.*

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

Manuel Lladser – Assistant Professor; PhD, Ohio State University. *Probability Theory.*

Thomas Manteuffel – Professor; PhD, University of Illinois, Urbana. *Computational Math, Numerical Linear Algebra, Iterative Mathematics, Numerical Solution of Partial Differential Equations, 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 – Post-Doctoral Associate; PhD, Yale University. *Harmonic Analysis, Wavelets.*

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

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

Juan Restrepo – Assistant Professor; PhD, Northeastern University.

Antonio Rubio - Post-Doctoral Research Associate; PhD, Arizona State University. *Computational Fluid Dynamics, Dynamical Systems.*

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

Kristian Sandberg – Research Associate; PhD, University of Colorado at Boulder. *Wave Propagation, Tomography, Image Processing.*

Jacob Schroder - Post-Doctoral Research Associate; PhD, *Iterative Methods, Finite Elements, Electromagnetics, Helmholtz Problem*

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

Tiejun Tong – Assistant Professor; PhD, University of California, Santa Barbara. *Statistics.*

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

Yi Zhu - Post-Doctoral Research Associate; PhD,

Affiliated Faculty

Steve C. Arendt – Colorado Research Associates

Mark Balas – Aerospace Engineering, Electrical Engineering

Meredith Betterton – Physics

Elizabeth Bradley – Computer Science

Richard Byrd – Computer Science

Xiao-Chuan Cai – Computer Science

John Cary – Physics

Senarath P. de Alwis – Physics

Thomas DeGrand – Physics

Alireza Doostan – Aerospace Engineering

Garland Durham – College of Business

Scot Elkington – Laboratory for Atmospheric and Space Physics (LASP)

Natasha Flyer – Institute for Mathematics Applied to Geosciences

Baylor Fox-Kemper – Cooperative Institute for Research in Environmental Sciences (CIRES)

Fred Glover – College of Business

Debra S. Goldberg – Computer Science

Martin Goldman – Physics

Vijay K. Gupta – Civil, Environmental, and Architectural Engineering

Ute C. Herzfeld – Institute of Arctic and Alpine Research (INSTAAR)

Christine M. Hrenya – Chemical and Biological Engineering

Tissa Illangasekare – Environmental Science and Engineering Division, Colorado School of Mines

Elizabeth Jessup – Computer Science

Laskshmi Kantha – Aerospace Engineering

David R. Kassoy – Mechanical Engineering

Dhinaker Kompala – Chemical and Biological Engineering

Manuel Laguna – College of Business

Michael Lightner – Electrical Engineering;

Oliver McBryan – Computer Science

Francois Meyer – Electrical and Computer Engineering

Kamran Mohseni – Aerospace Engineering

Doug Nychka – Geophysical Statistics Project, National Center for Atmospheric Research (NCAR)

Lev Ostrovsky – National Oceanic and Atmospheric Administration (NOAA)

K. C. Park – Aerospace Engineering

Scott Parker – Physics

Annick Poquet – National Center for Atmospheric Research (NCAR)

Harihar Rajaram – Civil, Environmental, and Architectural Engineering

Steven Sain – Institute for Mathematics Applied to Geosciences

Robert Sani – Chemical Engineering

Daniel Scheeres – Aerospace Engineering

J. Michael Shull – Astrophysical and Planetary Sciences (APS)

Rex Skodje – Chemistry

James Syvitski – Institute for Arctic and Alpine Research (INSTAAR)

Juri Toomre – Astrophysical and Planetary Sciences (APS)

Henry Tufo – Computer Science

Oleg V. Vasilyev – Mechanical Engineering

Thomas Warner – Atmospheric and Oceanic Sciences

Patrick Weidman – Mechanical Engineering

Jeffrey B. Weiss – Astrophysical and Planetary Sciences (APS), Atmospheric and Oceanic Sciences.

Joseph Werne – Colorado Research Associates

Department Staff

Marcia Flynt – Director of Operations

Susan Pryor – Graduate Program Assistant.

(Until April 30, 2010) **David Hanley** – Accounting Technician and Undergraduate Program Assistant.

(After July 1, 2010) **Beth Klein** - Accounting Technician

Ian Cunningham - Office Coordinator and Undergraduate Program Assistant *(beginning in Fall 2010)*

Shannon Priem, Vincent Wheeler – Part-Time Student Assistants

Changes in Personnel

Assistant Professor **Tiejun Tong** began a year long leave of absence in the summer of this year.

Associate Professor **Vanja Dukic** joined the department in Fall 2010. Dr. Dukic is a statistician from the University of Chicago, with a research focus on predictive modeling, especially in biological fields of study. The Department of Applied Mathematics has identified statistics as a major growth field, and the acquisition of Dr. Dukic advances the department into a stronger position within the field.

Applied Mathematics Account Technician **David Hanley** departed for a new position with Dish Network in April. His replacement, **Beth Klein**, joined the department on July 1st, 2010. Beth comes to the department from the US Postal Service. David's responsibilities as Undergraduate Program Assistant were filled by Student Assistant **Shannon Priem** over the summer, and were taken over by Office Coordinator **Ian Cunningham** with the start of the Fall Semester.

Per-Gunnar Martinsson and wife welcomed their second child, **Ida Martinsson**, into the world in April.

Visitors in 2010

In addition to our speakers who visited to present talks (listed beginning on page 13), faculty from other universities will visit Applied Mathematics in order to work with their collaborators in the department. Visitors are normally housed in the department's visitor's office (ECOT 215).

Tao Jiang of Zhejiang Gongshang University in China concluded his visit that began in April 2009 on March 10. He was hosted by Tiejun Tong.

Silvana DeLillo of Università degli Studi di Perugia, Italy visited the department from April 23 to May 8th. She was working with Dr. Ablowitz.

Ben Herbst of the University of Stellenbosch, South Africa visited Applied Mathematics from May 17th until September 15th. Dr. Herbst was sponsored by APPM faculty member Bengt Fornberg.

Yutian Lei of Nanjing Normal University returned to China on August 20, after a year working with APPM sponsor Congming Li.

Piotr Zgliczynski of Jagiellonian University in Kraków, Poland visited APPM on November 22nd and 23rd. He was sponsored by APPM faculty member Jim Meiss.

Department of Applied Mathematics 2010 Annual Report
Departmental Seminars and Colloquia

Tuesdays - Computational Math Seminar

The Computational Mathematics seminar series was held on Tuesday mornings during the academic year at 10:00 am, in the Grandview Conference Room. Steve McCormick chaired and organized the seminars in the spring semester, and Tom Manteuffel chaired and organized in the fall.

02/16/10	**Perrine Pepiot**, National Renewable Energy Laboratory (NREL)	*Advanced Numerical Techniques for Large-scale Reactive Simulations of Energy Conversion Devices*
03/16/10	**Perrine Pepiot**, National Renewable Energy Laboratory (NREL)	*Advanced Numerical Techniques for Large-scale Reactive Simulations of Energy Conversion Devices*
04/13/10	**Fynn Scheben**, Department of Mathematics, University of Bath	*Iterative Methods for Computing Criticality in Nuclear Reactors*
08/31/10	**Lei Tang**, Department of Applied Mathematics, University of Colorado at Boulder	*Parallel, Adaptive, First-Order System Least-Squares (FOSLS) for Magnetohydrodynamics (MHD)*
09/14/10	**Anna Lieb**, Department of Applied Mathematics and Theoretical Physics, Cambridge University	*Simulation and Measurement in Lattice QCD*
09/21/10	**Christian Ketelesen**, Department of Applied Mathematics, University of Colorado at Boulder	*A Least-Squares Finite Element Discretization of the Schwinger Model*
09/28/10	**Hari Rajaram**, Department of Civil, Environmental, and Architectural Engineering, University of Colorado at Boulder	*Computation of Radionuclide Transport in Fractured Rock at Field Scales*
10/05/10	**David Levin**, School of Mathematical Sciences, Tel Aviv University	*Extrapolation Models*
10/19/10	**Scott MacLachlan**, Department of Mathematics, Tufts University	*Multigrid Preconditioning Strategies for the Helmholtz Equation*
10/26/10	**Jehanzeb Chaudhry**, Department of Computer Science, University of Illinois	*Finite Element Methods for Poisson-Boltzmann Models*
11/16/10	**Lei Tang** and **Min Ho Park**, Department of Applied Mathematics, University of Colorado at Boulder	*Parallel Efficiency-based Adaptive Local Refinement Relaxation-corrected Bootstrap Algebraic Multigrid (rBAMG)*

11/30/10	**Amrik Sen**, Department of Applied Mathematics, University of Colorado at Boulder	*Flow past an airfoil via conformal mapping*
12/07/10	**Dan Kaslovsky**, Department of Applied Mathematics, University of Colorado at Boulder	*Uncovering Local Manifold Geometry and Processing Large Data Sets*

Tuesdays - Nonlinear Waves Seminar

The Nonlinear Waves seminar series was held on Tuesday afternoons in the Spring 2010 semester at 4:00 pm, in ECOT 226. Mark Ablowitz chaired and organized the seminar series, with assistance from graduate student Douglas Baldwin

01/26/10	**Edmund Y.M. Chiang**, Department of Mathematics, Hong Kong University of Science and Technology	*A New Picard-Type Theorem Associated with Q-Special Functions*
02/09/10	**Kamran Mohseni**, Department of Aerospace Engineering Sciences, University of Colorado at Boulder	*Shock and Turbulence Regularization in Euler Equations: Derivation from Basic Principles*
03/17/10	**Boaz Ilan**, Department of Applied Mathematics, University of California at Merced	*Dynamics of Nonlinear Bound States in Inhomogeneous Media*
04/06/10	**Theodoros Horikis**, Department of Mathematics, University of Ioannina, Greece	*Excited Bose-Einstein Condensates: Dark Solitons and Quadrupole Oscillations*
04/20/10	**Theodoros Horikis**, Department of Mathematics, University of Ioannina, Greece	*The Short Pulse Equation and Its Variants*
05/05/10	**Bernard Deconinck**, Department of Applied Mathematics, University of Washington	*The Instabilities of Surface Water Waves*

Thursdays - Complex Systems/Dynamics Seminar

The Complex Systems/Dynamics seminar series was held on Thursday afternoons during the academic year at 2:00 PM, in the Applied Mathematics Conference Room. Jim Meiss and Juan Restrepo co-chaired this series.

01/14/10	**Juan Restrepo**, Department of Applied Mathematics, University of Colorado at Boulder	*Period-Two Spatiotemporal Dynamics of Intracellular Calcium*
01/21/10	**James Meiss**, Department of Applied Mathematics, University of Colorado at Boulder	*Transitory Dynamical Systems*
01/28/10	**Kamran Mohseni**, Department of Aerospace Engineering Sciences, University of Colorado at Boulder	*A Fluid Cooperative Control Technique for Aerial and Underwater Sensor Networks*
02/04/10	**Mingzhong Wu**, Department of Physics, Colorado State University	*Excitation of Chaotic Surface Spin Waves in Magnetic Thin Film-based Active Feedback Ring*
02/11/10	**Noah Fitch**, Department of Physics, University of Colorado at Boulder	*Hamiltonian Monodromy and the Resonant Elastic Pendulum*

02/18/10	**Jason James**, Department of Mathematics, Rutgers University	*Computation of Connecting Dynamics by Parameterization of Invariant Manifolds*
02/25/10	**Woodrow Shew**, National Institutes of Health/National Institute of Mental Health (NIH/NIMH)	*Phase Transitions and Stimulus Processing in the Brain*
03/04/10	**Arthur Pardi**, Department of Chemistry and Biochemistry, University of Colorado at Boulder	*Methods for Fitting Kinetic Data on Single Molecules: Is Hidden Markov Modeling the Way to Go?*
03/11/10	**Bob Rink**, Department of Mathematics, Vrije University, Amsterdam	*Ghost Circles in Lattice Aubry-Mather Theory*
03/18/10	**Antonio Rubio**, Department of Applied Mathematics, University of Colorado at Boulder	*Onset of Kuppers-Lortz-like Dynamics in Finite Rotating Thermal Convection*
04/01/10	**Daniel Larremore**, Department of Applied Mathematics, University of Colorado at Boulder	*Role of Network Topology in the Dynamic Range of Coupled Excitable Systems*
04/15/10	**Radu Cascaval**, Departmentof Mathematics, University of Colorado at Colorado Springs	*Autoregulation Mechanisms in Complex Networks*
04/22/10	**Alexandra Tzella**, Ecole Normale Supérieure, Paris	*Spatial Structures in Chaotically Advected Chemical Fields: The Role of a Delay Time*
09/02/10	**Sebastian Skardal**, Department of Applied Mathematics, University of Colorado at Boulder	*Spatiotemporal Dynamics of Calcium-Driven Alternans in Cardiac Tissue*
09/09/10	**Aaron Clauset**, Department of Computer Science, University of Colorado at Boulder	*The Trouble with Community Detection*
09/23/10	**Bob Easton**, Department of Applied Mathematics, University of Colorado at Boulder	*Financial Alchemy*
09/30/10	**Jim Meiss**, Department of Applied Mathematics, University of Colorado at Boulder	*The Last Invariant Torus in Volume Preserving Maps*
10/07/10	**Lincoln Carr**, Department of Physics, Colorado School of Mines	*Distinguishing Fact from Fiction: Pattern Recognition in Texts using Complex Networks*
10/14/10	**Daniel Larremore**, Department of Applied Mathematics, University of Colorado at Boulder	*Explosive Connectivity in the "Social Climber" Percolation Model*
10/21/10	**Jeffrey Weiss**, Department of Atmospheric and Oceanic Sciences, University of Colorado at Boulder	*Nonequilibrium Fluctuations and Climate Variability*
10/28/10	**Dustin Reishus**, NSF Computing Innovations Fellowship at the University of Colorado	*Mathematics of the Law of Mass Action*

11/04/10	**Iuliana Oprea**, Department of Mathematics, Colorado State University	*From order to spatiotemporal complexity in nematic electroconvection*
11/18/10	**Oleg Makarenkov**, Department of Mathematics, Imperial College, London	*Linear and Piecewise Linear Maps in Studying Grazing Bifurcations of a Periodic Solution*
12/02/10	**Daniel Kaslovsky**, Department of Applied Mathematics, University of Colorado at Boulder	*Uncovering Local Manifold Geometry and Processing Large Data Sets*

Fridays - Applied Mathematics Colloquium

The Applied Mathematics Colloquium series was held on Friday afternoons during the academic year at 3:00 pm, with refreshments preceding at 2:30 pm outside the Applied Mathematics conference room. Harvey Segur chaired and organized the Colloquium Series in Spring, with David Bortz taking the reins in Fall.

01/15/10	**Bengt Fornberg**, Department of Applied Mathematics, University of Colorado at Boulder	*Radial Basis Function Methods for Solving Partial Differential Equations*
01/22/10	**Nathalie Moyen**, Leeds School of Business, University of Colorado at Boulder	*Corporate Cash Savings: Precaution vs Liquidity*
01/29/10	**Chris Calderon**, Computational and Applied Mathematics Department, Rice University	*Characterizing Nanoscale Dynamics via a Collection of Estimated Stochastic Differential Equations*
02/05/10	**Haonan Wang**, Department of Statistics, Colorado State University	*Some Statistical Analysis When Data are Tree-Structued Objects*
02/12/10	**Chun Liu**, Institute for Mathematics and ITS Applications, University of Minnesota	*Energetic Variational Approaches in Calcium and Sodium Channels*
02/19/10	**Samuel Flaxman**, Department of Ecology and Evolutionary Biology, University of Colorado at Boulder	*Ecological and Evolutionary Consequences of Predator-Prey Coevolution*
02/26/10	**Mettupalayam Sivaselvan**, Department of Civil, Environmental, and Architectural Engineering, University of Colorado at Boulder	*Exploring Failures of Engineering Structures in Extreme Events*
03/05/10	**Geoffrey Spedding**, Department of Aerospace and Mechanical Engineering, University of Southern California at Los Angeles	*Aeronautics at Low Reynolds Number*
03/12/10	**Sijue Wu**, Department of Mathematics, University of Michigan	*Wellposedness of the Two and Three Dimensional Full Water Wave Problem*

04/02/10	**Dan Goldman**, Senior Research Scientist, Adobe Systems, Inc.	*PatchMatch: A Randomized Correspondence Algorithm for Structural Image Editing*
04/23/10	**Carl Bender**, Department of Physics, Washington University at St. Louis	*Making Sense of Non-Hermitian Hamiltonians*
08/27/10	**Ralph Smith**, Department of Mathematics, North Carolina State University	*Model Development and Control Design for High Performance Nonlinear Smart Material Systems*
09/03/10	**John Crimaldi**, Department of Civil, Environmental, and Architectural Engineering, University of Colorado at Boulder	*Coral Fertilization as a Model System for Reactive Stirring and Mixing in Structured Flows*
09/10/10	**Rouslan Krechetnikov**, College of Engineering, University of California at Santa Barbara	*Dissipation-Induced Instabilities in Nature and Mathematics*
09/17/10	**Jie Shen**, Department of Mathematics, Purdue University	*Phase-Field Models for Multiphase Complex Fluids: Modeling, Numerical Analysis and Simulations*
09/24/10	**Marty Golubitsky**, Mathematical Biosciences Institute, Ohio State University	*Animal Gaits and Symmetries of Periodic Solutions*
10/01/10	**Alireza Doostan**, Department of Aerospace Engineering Sciences, University of Colorado at Boulder	*Uncertainty Quantification: Towards Predictive Computational Modeling*
10/08/10	**Baylor Fox-Kemper**, Cooperative Institute for Research in Environmental Sciences (CIRES)	*What's Lurking at the Subgrid Scale in Ocean Climate Models?*
10/15/10	**Carl Koval**, Department of Chemistry and Biochemistry, University of Colorado at Boulder	*History and Future of CU-Boulder's Newest Institute: RASEI and Prospectus on Creating a Solar Fuels Industry*
10/22/10	**Sriram Sankaranarayanan**, Department of Computer Science, University of Colorado at Boulder	*Algebraic Invariant Synthesis for Hybrid Systems*
10/29/10	**Tim Chartier**, Department of Mathematics, Davidson College	*Sports Ranking - March Madness to Twitter*
11/05/10	**Henry Kapteyn**, Joint Institute for Laboratory Astrophysics (JILA)	*The Nonlinear Optics of Coherent X-Ray Generation*
11/12/10	**Alain Karma**, Department of Physics, Northeastern University	*Mathematical Models of Fracture and Singular Perturbations*
11/19/10	**Arthi Jayaraman**, Jayaraman Group, University of Colorado at Boulder	*Molecular Theory and Simulation Studies of Polymer Functionalized Nanoparticles*
12/03/10	**Eric Shea-Brown**, Department of Applied Mathematics, University of Washington	*Cooperative Dynamics in Simple Neural Circuits*

Other Applied Math Talks

Applied Mathematics often offers special talks that do not fall within the normal seminar schedule. There are many reasons for this, but all are as important as any of our regularly scheduled seminars.

03/06/10	**Geoffrey Spedding**, Department of Aerospace and Mechanical Engineering, University of Southern California at Los Angeles	*The Aerodynamics of Everything*
09/09/10	**Ben Herbst**, Department of Applied Mathematics, University of Stellenbosch, South Africa	*Case Studies in Machine Learning and Computer Vision*
11/17/10	**Marek Grabowski**, Department of Physics, University of Colorado at Colorado Springs	*Dynamics of a Driven Spin*

This design was used for the invitations to the reception following Dr. Spedding's March 5th talk, part of the Applied Mathematics's 2010 Spring Celebration

Department of Applied Mathematics 2010 Annual Report
Student Organizations

Undergraduate Organizations

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. Sujeet Bhat served as the faculty advisor for the Undergraduate Chapter in 2010. Carly Smith, Amanda Crawford, and Stephen Kissler served as the student officers.

The undergraduate chapter of SIAM had one major Spring activity and two activities in the Fall:

6th Annual Front Range Applied Mathematics Student Conference
Saturday, March 6th, 2010
Location: The University of Colorado at Denver
This conference allowed student representatives from universities across the Front Range to meet and share research in the field of applied mathematics.

2010-2011 SIAM Undergraduate Chapter Kickoff
Thursday September 2nd, 2010
Location: ECOT 831 (Engineering Center)
An introductory meeting for all members of the SIAM Undergraduate Chapter. We discussed future plans for the group, including field trips, guest speakers, and service projects, and shared our summer research and internship experiences.

Candy Engineering Contest
Tuesday November 2nd, 2010
Location: DLC Bechtel Collaboratory
Enter your team and come build a structure of your choice with candy provided by the SIAM Undergraduate Chapter! Judges will choose the best structures, but win or lose, you can eat your creation at the end. A great event for those who want to broaden their understanding of alternative building materials.

Graduate Organizations

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. Tom Manteuffel served as the Faculty Advisor for the Graduate Chapter in 2010. Adam Fox served as chapter president, and Dan Kaslovsky as chapter vice-president.

The SIAM Graduate chapter presented three student talks in 2010, as well as participated in the 6th Annual Front Range Applied Mathematics Student Conference.

Department of Applied Mathematics 2010 Annual Report
Faculty Research

Department-wide Grants

The NSF-MCTP Colorado Advantage Proposal was funded in July 2006 and the academic year 2010-2011 was the fifth year of the grant. This past year MCTP funded more than 20 undergraduate students working with faculty and 4 graduate students. Undergraduates worked with 15 faculty members in Applied Mathematics or affiliated disciplines. Affiliated faculty working with Applied Math undergraduates included: Computer Science; Electrical Computing and Energy Engineering; Mechanical Engineering; and Environmental and Evolutionary Biology. The grant also provided support for 4 graduate students, with either full funding for the academic year or partial support. More importantly, department faculty were engaged in research activities with undergraduates along with their graduate students.

In 2008, the NSF awarded a $450,000 grant to CU to continue the Oral Examinations project Mary Nelson began in 2006. The grant is called CCLI, for Course, Curriculum and Laboratory Improvement. Nationwide, 40 % of college students take some version of first-semester Calculus. But 40% of the students who take that course do not pass it. Most of them do not go on to take Calculus II, which means at least that they drop out of majors in Engineering, Science or Math, and often means that they drop out of CU altogether. Mary's research has indicated a correlation between oral examinations focusing on the concepts of the subject prior to testing the particulars on their written exams and increased final scores in the course.

Individual Research Grants

In 2010, Applied Mathematics faculty collectively acted as Primary Investigators (PI) for over 12.5 million dollars in grant-funded research. Most of these grants were NSF-funded, but the department also performed research for the United States Departments of Defense and Energy, NASA, the National Institutes for Health, and several independent laboratories. Applied Mathematics researchers have collaborated with scientists and mathematicians all over the nation, as well as internationally. The department is proud of the excellent work being produced by our faculty, and list their active grants below, with research in which they served as PI on the left, and that in which they collaborated as a Co-PI to the right.

Mark J. Ablowitz

Air Force Office of Scientific Research (AFOSR), Program in Physical Mathematics: Nonlinear Wave Propagation
2008-2011

National Science Foundation-Divison of Mathematical Sciences (NSF-DMS): Nonlinear Wave Motion
2006-2010

NSF-DMS: Nonlinear Wave Motion
2009-2012

Gregory Beylkin

Department of Energy (DoE): Integrated Multiscale Modeling of Molecular Computing Devices
2007-2010

DoE/UT-Battelle/Oak Ridge National Laboratory: Multiresolution Adaptive Numerical Evaluation and Scientific Simulation
2005-2011

NSF-DMS: Fast Multiresolution Methods and Nonlinear Approximations for Multidimensional Problems
2006-2010

AFOSR-Small Business Technology Transfer Program (STTR) (Numerica): Efficient propagators and gravity models in non-Cartesian coordinate systems
2010-2011

AFOSR-STTR (Omnitron): Innovative Earth Gravity Reformulation and Numerical Integration for Responsive Space Situational Awareness (SSA)
2010

David M. Bortz

AFOSR: Solving Differential Equations with Random Ultra-Sparse Numerical Discretizations
2009-2011
Co-Pi: A.J. Christlieb

DoE-National Renewable Energy Laboratory (NREL): Applied Mathematics Research for High Performance Systems Biology
2009-2011

Co-PI on:
National Institutes of Health (NIH): Biomechanics of Bloodstream Infections
PI: John Younger *Co-PI: M. Solomon*

NSF: Type II: Flow-induced fragmentation mechanisms in bacterial biofilms by hierarchical modeling of polymeric, interfacial and viscoelastic interactions
PI: M. Solomon

Jem Corcoran

National Institute of Standards and Technology (NIST): Summer Undergraduate Research Fellowship (SURF)
2010

James H. Curry

NSF: Mentoring Through Critical Transition Points
2006-2011
Co-PIs: A. Dougherty, K. Julien

Joint Mathematics Meeting: Good Intentions Are Necessary but Not Sufficient: Steps Toward Best Practices in Mentoring Underrepresented Students
2011

Co-PI on:
NSF: Course Curriculum and Laboratory Improvement (CCLI)
PI: Mary Nelson
Co-PIs: A. Dougherty, H. Segur

Anne M. Dougherty

Co-PI on:
NSF: CCLI Phase 2; Colorado Momentum: Oral Assessment in the Mathematical Sciences Classroom
PI: Mary Nelson
Co-PIs: J. Curry, H. Segur

CU-Boulder Outreach Committee: Colorado Math Circle
PI: Silva Chang
Co-PI: C. Li

NSF: Mentoring Through Critical Transition Points
PI: James H Curry
Co-PIs: A. Dougherty, K. Julien, J. Meiss, H. Segur

Vanja Dukic

NIH: Translational approaches to multilevel models of prenatal exposure to cigarettes
2010-2014

Co-PI on:
NIH: Modeling the spread of MRSA in the Community
PIs: Diane Lauderdale and *Charles Macal*
Co-PI: D. Wegener

NSF: Combining models and experiments to understand heterogeneities in susceptibility and virulence
PI: Greg Dwyer

Bengt Fornberg

NSF-DMS: Radial Basis Functions
2006-2011

NSF-DMS: Radial Basis Functions
2009-2012

Co-PI on:
Department of Defense - Army Research Office (DOD-ARO):
Training Knowledge and Skills for the Networked Battlefield
PIs: Alice Healy and *Lyle Bourne*
Co-PIs: B. Clegg, C. Gonzalez, E. Heggestad, R. Laughery, R. Proctor

NSF-Division of Atmospheric Sciences (ATM):
Freedom from Coordinate Systems and Spectral Accuracy with Local Refinement: Radial Basis Functions for Climate and Space-Weather Prediction
PI: Natasha Flyer
Co-PIs: G. Wright, C. Jablonowski, J. Muccino

Keith Julien

NASA Solar Heliospheric: Modeling Magneto-Inertial-Gravity waves in the Lower Convection Zone
2006-2011

NSF-Focused Research Groups in the Mathematical Sciences (FRG): Models of Balanced Multiscale Ocean Physics for Simulation and Parameterization
2009-2012
Co-PIs: B. Fox-Kemper, J. Weiss

Co-PI on:
NSF: Mentoring Through Critical Transition Points
PI: James H Curry
Co-PIs: A. Dougherty, J. Meiss, H. Segur

NASA Physical Oceanography: Langmuir Circulations; Observing and Modeling on Global Scales
PI: Baylor Fox-Kemper
Co-PIs: G. Chini, E. Knobloch

Keith Julien (cont.)

NSF-Collaboration in Mathematical Geosciences (CMG): Multiscale Modeling of the Coupling between Langmuir Turbulence and Submesoscale Variability in the Oceanic Mixed Layer
PI: Baylor Fox-Kemper

Congming Li

NSF-DMS: The Role of Convection on Dynamic Stability of 3D Incompressible Navier-Stokes Equations
2009-2012

Co-PI on:
CU-Boulder Outreach Committee: Colorado Math Circle
PI: Silva Chang
Co-PI: A. Dougherty

NSF-Division of Earth Sciences (EAR): Multiscale nonlinear domain decomposition method for modeling the impact of climate change on groundwater resources
PI: Shemin Ge
Co-PIs: X.C. Cai, M. Williams

Manuel B. Lladser

NSF-DMS: Markovian Embeddings for the Analysis and Computation of Patterns in non-Markovian Random Sequences
2008-2011

NIH: Scientific Computation for RNA Catalysis of Translocational Reactions
PI: Michael Yarus

NIH: New Tools for Understanding the Composition and Dynamics of Microbial Communities in Human Body Habitats
PI: Robin Knight

Thomas A. Manteuffel

DoE: First-order system least-squares (FOSLS) for nonlinear systems arising from DOE applications
2010-2013
Co-PI: S. McCormick

NSF-EAR: Modeling River Basin Dynamics: Parallel Computing and Advanced Numerical Methods
2006-2011
PIs: Tom Manteuffel and *Scott Peckham*
Co-PIs: S. McCormick, G. Tucker

Co-PI on:
DoE: Towards Optimal Petascale Simulation (TOPS)
PI: Steve McCormick
Co-PI: X.C. Cai

NSF: Enhanced Least-Squares Methods for PIV Analysis
PI: Steve McCormick

NSF-Office of CyberInfrastructure (OCI): Multigrid QCD at the Petascale
PI: Steve McCormick

Per-Gunnar Martinsson

NSF-DMS: CAREER: Fast Direct Solvers for Differential and Integral Equations
2008-2011

Co-PI on:
NSF-DMS: CDI-Type I: Geometrical Image Processing with Fast Randomized Algorithms
PI: Francois Meyer

Steve McCormick

DoE: Towards Optimal Petascale Simulation (TOPS)
2006-2011
Co-PI: X.C. Cai, T. Manteuffel

Lawerence Livermore National Laboratories: Geometric and Algebraic Multigrid Methods for QCD, MHD, Elasticity, Transport, and Other DOE Applications
2007-2011

NSF-OCI: Multigrid QCD at the Petascale
2007-2011
Co-PI: T. Manteuffel

NSF: Enhanced Least-Squares Methods for PIV Analysis
2008-2013
Co-PI: Steve McCormick

Co-PI on:
DoE: First-order system least-squares (FOSLS) for nonlinear systems arising from DOE applications
PI: Thomas Manteuffel

NSF-EAR: Modeling River Basin Dynamics: Parallel Computing and Advanced Numerical Methods
PIs: Tom Manteuffel and *Scott Peckham*
Co-PI: G. Tucker

James Meiss

Co-PI on:
NSF: Mentoring Through Critical Transition Points
PI: James H Curry
Co-PIs: A. Dougherty, K. Julien, H. Segur

Mary Nelson

NSF: CCLI Phase 2; Colorado Momentum: Oral Assessment in the Mathematical Sciences Classroom
2008-2011
Co-PIs: J. Curry, A. Dougherty, H. Segur

Harvey Segur

NSF-DMS: Nonlinear Dispersive Waves with Weak Dissipation
2007-2011

Co-PI on:
NSF: CCLI Phase 2; Colorado Momentum: Oral Assessment in the Mathematical Sciences Classroom
PI: Mary Nelson
Co-PIs: J. Curry, A. Dougherty

NSF: Mentoring Through Critical Transition Points
PI: James H Curry
Co-PIs: A. Dougherty, K. Julien, J. Meiss

Tiejun Tong

Co-PI on:
Defense Advanced Research Projects Agency (DARPA):
Enabling Stress Resistance with Controllable Exercise
PI: Monika Fleshner

Publications

Research dollars alone do not measure the quality of an academic body's faculty - the dictum of "Publish or Perish" still holds. Applied Math faculty have published dozens of articles and several books in 2010. We cite these materials below.

Mark J. Ablowitz

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S. Chakravarty and M. J. Ablowitz, "Parameterizations of the Chazy equation"***,*** *Studies in Applied Mathematics,* **vol. 124***, pp. 105-135.*

M.J. Ablowitz and T.S. Haut, "Asymptotic expansions for large amplitude solitary gravity-capillary waves"***,*** *Journal of Physics A: Mathematical and Theoretical,* **vol. 43***, article no. 434005.*

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Gregory Beylkin

G. Beylkin and L. Monzon, "Approximation by exponential sums revisited"***,*** *Applied and Computational Harmonic Analysis,* **vol. 28***, pp. 131-149.*

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Christopher W. Curtis

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Vanja Dukic

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B. Fornberg, "A finite difference method for free boundary problems", *Journal of Computational and Applied Mathematics*, **vol. 233**, *pp. 2831-2840*.

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Keith Julien

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K. Julien and E. Knobloch, "Magnetorotational Instability: Recent Developments"***,*** *Philosophical Transactions Of The Royal Society A - Mathematical Physical And Engineering Sciences* **Vol. 368, Iss. 1916** *pp. 1607-1633*

Congming Li

Wenxiong Chen and Congming Li, "Methods on nonlinear elliptic equations"***,*** *AIMS Book Series on Differential Equations & Dynamical Systems* **vol. 4**

W. Chen, C. Li, "On the stationary solutions of the 2-D Doi-Onsager Model"**,** *Nonlinear Analysis*, **vol. 73,** *pp. 2410-2425*.

Manuel B. Lladser

Algorithmic Probability and Combinatorics, **Vol. 520** (American Mathematical Society (AMS), 2010)**,**
Editors: M. Lladser (chair), R. Maier, M. Mishna, A. Rechnitzer

M. Illangasekare, R. Turk, G. C. Peterson, M. Lladser, M. Yarus, "Chiral histidine selection by D-ribose RNA", *RNA*, **vol. 16, iss. 12**, *pp. 2370-2383*

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Per-Gunnar Martinsson

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James Meiss

Simpson, D. J. W. and J. D. Meiss, "Resonance near Border-Collision Bifurcations in Piecewise-Smooth, Continuous Maps." *Nonlinearity* **vol. 23,** *pp. 3091-3118.*

Juan G. Restrepo

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Harvey Segur

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Tiejun Tong

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S. Huang, T. Tong and H. Zhao, "Bias-corrected Diagonal Dis-criminant Rules for High-Dimensional Classification"***,*** *Biometrics,* **vol. 66,** *pp. 1096-1106.*

Invited Lectures and Meetings Attended

The department of Applied Mathematics is filled with dynamic instructors and active researchers. Presenting their results at other universities and at meetings of their peers demonstrates both of these traits. Sharing knowledge is vital to the scientific process - below we list the locations around the globe that our faculty have given and received shared knowledge.

Gregory Beylkin

"Nonlinear Approximations in Scientific Computing"***; WesternGeco, Denver, CO;*** March 3

"Full wave equation depth extrapolation for migration"***;SIAM Conference on Imaging Science, Chicago, Il;*** April 12 *(with Kristian Sandberg)*

"Rotationally Invariant Quadratures for the Sphere"***; DOE Applied Math Conference;*** May 3-5 *(with Cory Ahrens)*

"Rotationally Invariant Quadratures for the Sphere"***; Optimal Configurations on the Sphere and Other Manifolds Conference, Vanderbilt University, TN;*** May 19 *(with Cory Ahrens)*

"Approximations and Fast Algorithms for Helmholtz Green's Functions"***; Integral Equation Methods, Fast Algorithms and Applications Workshop, Institute for Mathematics and its Applications, Minneapolis, MN;*** August 4

"Nonlinear Approximations and some of their applications"***; University of Pennsylvania, AMCS Colloquium;*** October 1

David M. Bortz

***SIAM Southeastern-Atlantic Section Conference; Raleigh, NC*;** March 20

Michigan State University Pi Mu Epsilon Induction; East Lansing, MI; March 22

World Meeting: International Society Bayesian Analysis; Benidorm, Spain; June 3

***SIAM Conference on the Life Sciences; Pittsburgh, PA*;** July 13

AFOSR Annual Review Meeting; Arlington, VA; July 29

NSF Soft Matter Workshop; Fort Collins, CO; September 13

***Purdue Mathematics Lunch Seminar; West Lafayette, IN*;** November 12

"Fragmentation of Bacterial Emboli and Biofilms in Flow" ***Purdue Applied Mathematics Seminar, West Lafayette, IN*;** November 12

Vanja Dukic

"Tracking Flu Epidemics using Google Flu Trends and Particle Learning" ***Department of Mathematics and Statistics, University of Colorado; Denver, CO*;** Spring

"Tracking Flu Epidemics using Google Flu Trends and Particle Learning" ***Department of Statistics, Colorado State University; Fort Collins, CO;*** Spring

"Tracking Flu Epidemics using Google Flu Trends and Particle Learning" ***National Center for Atmospheric Research (NCAR); Boulder, CO;*** Spring

"SCIS population models for spread of CA-MRSA in Chicago" ***National Scientific MIDAS meeting; Washington DC;*** Spring

"Bayesian Ranking and GWAS Uncertainty" ***ISBA 2010 (Valencia 9); Benidorm, Spain***; Summer 2010: "Bayesian Modeling of Smoking in Pregnancy" *(poster)* ***ISBA 2010 (Valencia 9); Benidorm, Spain***; Summer

"Bayesian Multiresolution Hazard Modeling, with Application to Breast Cancer Recurrence" ***Department of Biostatistics, University of Colrado; Denver, CO;*** Autumn

"Bayesian Modeling of Smoking Metabolism" ***Department of Statistics, Duke University; Durham, NC;*** Autumn

"Population modeling for bacterial meningitis in sub-Saharan Africa" ***Environmetrics 2010; Boulder, CO;*** Autumn

Keith Julien

"The NonHydrostatic Balanced Geostrophic Equations." ***Workshop I, Equation Hierarchies in Climate Modeling. Long Program on Model and Data Hierarchies for Simulating and Understanding Climate. Institute for Pure and Applied Mathematics (IPAM); University of California at Los Angeles***; March

"Derivation of Asymptotically Reduced Equations in Rotating Cylindrical and Spherical Geometries." ***I & II (Two Seminars) UCLA Earth Sciences Spinlab Seminar;*** April

"The NonHydrostatic Balanced Geostrophic Equations." ***Workshop on Rotating and Stratified Turbulence, NCAR; Boulder, CO*;** August

"The NonHydrostatic Balanced Geostrophic Equations." ***Workshop on Convection, Magnetoconvection and Dynamo Theory, Institut d'Etudes Scientifiques de Cargèse (I.E.S.C), Cargese, France;*** September

"The NonHydrostatic Balanced Geostrophic Equations: From Rayleigh-Benard towards Penetrative Convection" ***New York University, Courant Institute;*** October

"Multiple-Scale Asymptotics for Oceanic Fluid Dynamics: Coupled Planetary- and Quasi-Geostrophic Equations" ***American Physical Society - Division of Fluid Dynamics Meeting; Longbeach,CA;*** November

"Joint Baroclinic and Convective Instability." ***American Physical Society - Division of Fluid Dynamics Meeting; Longbeach,CA;*** November

"Rapidly Rotating Wall Mode Convection" ***American Physical Society - Division of Fluid Dynamics Meeting; Longbeach,CA;*** November

"Numerical Simulations of an Asymptotically Reduced Model of Anisotropic Langmuir Turbulence" ***American Physical Society - Division of Fluid Dynamics Meeting; Longbeach,CA;*** November

"An asymptotic model for rotationally-constrained non-penetrative thermal convection" ***American Physical Society - Division of Fluid Dynamics Meeting; Longbeach, CA;*** November

"Convective Flows under Strong Rotational Constraint". ***Applied Math Colloquium, University of Michigan;*** November 9th.

"Reduced Models for Astrophysical Accretion Disks." ***Complex Systems Seminar. University of Michigan;*** November 9th.

Congming Li

The 7th East China Partial Differential Equations Conference

Colloquium at Department of Math; Wayne State University

Colloquium at Department of Math; Xiamen University

Seminar at Department of Math; Beijing Univ. of Technology.

Seminar at Academy of Mathematics and Systems Sciences; Chinese Academy of Sciences.

2010 Oklahoma PDE Workshop

Manuel Lladser

Combinatorics Seminar, Laboratoire Bordelais de Recherche en Informatique, Université Bordeaux 1, Bordeaux, France; February

Probability and Statistics Seminar, Department of Mathematics, University of Colorado - Boulder; April

21st International Meeting on Probabilistic, Combinatorial, and Asymptotic Methods in the Analysis of Algorithms, Vienna, Austria; June

Séminaire d'algorithmique, Département d'informatique, University of Caen, France; June

Combinatorics and Probability Seminar, Department of Mathematics, University of Pennsylvania; September

Bioinformatics Supergroup, University of Colorado - Boulder; October

Science Short Presentation, CIMB meeting; December

Tom Manteuffel

DOE Applied Mathematics PI Meeting, Berkeley, CA; May 3

IMA Workshop on Numerical Solutions of Partial Differential Equations, University of Minnesota; December 2

Per-Gunnar Martionsson

"Normalized power iterations for the computation of SVD." ***NIPS workshop on low-rank methods for large-scale machine learning***; ***Vancouver, BC***.

"Enabling very large-scale matrix computations via randomization" ***Workshop on "Sparse Random Structures: Analysis and Computation"; Banff, AB;*** January

"Fast numerical methods for solving elliptic PDEs" ***Applied mathematics seminar, Brown University; January***

"Randomized methods for computing the Singular Value Decomposition (SVD) of very large matrices" ***MMDS 2010 Workshop on Algorithms for Modern Massive Data Sets."; Stanford, CT;*** June

"Fast direct solvers for elliptic PDEs" ***"Integral Equation Methods, Fast Algorithms and Applications" hot topics workshop at IMA (Univ. Minnesota);*** August

"Randomized methods for computing the Singular Value Decomposition (SVD) of very large matrices" ***IMA conference on numerical linear algebra and optimization; University of Birmingham (UK);*** September

"Fast direct solvers for elliptic PDEs" ***Applied mathematics seminar at Purdue University;*** November

Mary Nelson

Poster presenation "Oral Assessments used as part of the CCLI2 grant"; ***Joint Mathematical Meetings;*** January

NSF Assessment and Dissemination Conference; Northern Virginia; April 8-9

Working conference on Concept inventories in STEM fields; Northern Virginia; May 10-11.

"How to Improve Your Teaching Profile if You Wish to Teach at a Teaching College"***; Teaching and Learning Seminar;*** Nov 9.

Poster Presentation***; Boulder STEM conference; Nov 15.***

"Oral Review: Improved retention, grades and understanding." ***Penn State University.*** Nov 18-19

Presentation***; National Learning Assistant Conference; University of Colorado at Boulder***

Juan Restrepo

"Period-two spatiotemporal dynamics of intracellular calcium"***; Dynamics and Complex Systems Seminar, Applied Math Department, University of Colorado at Boulder;*** January

"The dynamic range in networks of coupled excitable systems"***, Nonlinear Dynamics on Networks workshop, Center for Scientific Computation and Mathematical Modeling, University of Maryland; College Park, MD;*** April

"How network topology affects dynamic range of neural networks"; ***National Institute of Mental Health, National Institutes of Health (NIH); Bethesda, Maryland;*** May

''The dynamic range in networks of coupled excitable systems"***; Applied Dynamics Seminar, University of Maryland; College Park, Maryland;*** May

Harvey Segur

"The modulational instability in water waves"***; Conference on Frontiers in Nonlinear Waves; Tucson, AZ;*** March 26-30

"Waves in shallow water"***; Conference on Symmetry plus Integrability; South Padre Island, TX;*** June 10-14

"The modulational instability, in deep water and elsewhere"***; NSF-CBMS Regional Conference on Nonlinear Water Waves; Edinburg, TX;*** May 17-21

"The modulational instability, in water waves and elsewhere"***; Conference entitled Wave Phenomena IV; Edmonton, Alberta, Canada;*** June 13-18

Department of Applied Mathematics 2010 Annual Report
Faculty Service

Service is the third pillar of faculty support for the University, alongside Teaching and Research. Activity in all three areas is required for tenure at the University of Colorado, and is expected of faculty even after achieving tenure. Service takes many forms, from membership on important governing committees, to educational outreach, to editing and reviewing scientific papers. Applied Mathematics faculty are active in all these areas and more.

Mark J. Ablowitz

Member/Chair of the *Department Postdoctoral-Instructor Committee*.

Chair of the *College Scholar Awards Committee* for the College of Arts and Sciences.

Member of *Cambridge Texts in Applied Mathematics Editorial Board:*

Member of *Studies in Applied Mathematics Editorial Board*

Member of *Dynamics of Partial Differential Equations Editorial Board*:

Gregory Beylkin

Member of the *Department Undergraduate Committee*

Member of the *University Biotechnology Initiative Committee*

Member of *Applied and Computational Harmonic Analysis Editorial Board*

Co-editor of special issues of *Applied and Computational Harmonic Analysis* in memory of Jean Morlet.

Reviewer on four papers

Reviewer on a proposal for NSF.

Sujeet Bhat

Course Coordinator, Spring *APPM 3310*

Course Coordinator, Summer *APPM 1360*

Course Coordinator, Fall *APPM 3310*

Course Coordinator, Fall *APPM 1360*

Faculty Advisor for *Undergraduate Chapter of SIAM,* Fall

Faculty Advisor for *Graduate Student Teachers*, Summer, *APPM 2360*

Faculty Mentor at *High School Honors Institute*, July 25-28

David M. Bortz

Member of the *Department Undergraduate Committee*

Affiliated with *Renewable and Sustainable Energy Institute (RASEI)*

Member of *University IQ•Biology Formation Committee*

Reviewer for *Mathematical Biosciences and Engineering*

Reviewer for *Journal of Numerical Mathematics Theory, Methods and Applications*

Jem Corcoran

Chair of the *Department Probability and Statistics Preliminary Examination Committee*.

Member of the *Department Instructor Search Committee*.

Member of the *Department Retirement Committee*

Reviewer for *Journal of Applied Probability*

Reviewer *Journal of Statistical Planning and Inference*

James H. Curry

Manages the *Afro-Americans in the Mathematical Science listserve*.

Member of the *National Research Council Fellowships Office Advisory Committee* (2006-present).

Chair of the *SIAM Di Prima Awards Committee*

Chair of *Department of Applied Mathematics*

Chair of *Department Program Review Process Committee*.

Member of the *College of Engineering's Diversity Action Committee*.

Member of the *Campus Interdisciplinary Computational Science and Engineering Program Development Committee*

Member of the *Search Committee for the Director of Research Computing*.

Member of the *ITS internal Review Committee*.

Associate Editor of the *SIAM online-Journal* (2008-present)

Reviewer on *German Dynamical Systems proposal*.

Member of the *NCAR IMAGe Advisory Committee*.

Chair of the *SIAM "The Richard C. DiPrima Prize" Selection Committee* (2009-present).

Trustee of the *University of Colorado Foundation*

Panelist for *NSF program in the math sciences*.

Anne M. Dougherty

Chair of the *Department of Applied Mathematics Undergraduate Committee*.

Associate Chair of *Department of Applied Mathematics*, July 1, 2000 to present.

Department representative to *University Admitted Students Day*, April 10, 2010;

Department representative to *College of Engineering Orientation* August 18-19, 2010.

Member of the *Undergraduate Education Council* in the College of Engineering.

Member of the *UEC Honors Subcommittee*

Member of the *College of Engineering Scholarship Committee*.

Member of the *ASSETT (Arts and Sciences Support of Education Through Technology) Advisory Committee*
January 2009 to the present.

Faculty Mentor at *High School Honors Institute*, July 25-28

Member of the *Actuarial Studies and Quantitative Finance Certificate Program Committee*
CU campus representative for the *Goldwater Scholarship*.

Member of the *Assistant Registrar for Degree Audit Systems Search Committee*.

Vanja Dukic

Program Chair for *Bayesian Statistical Science (ASA), for the Joint Statistical Meetings 2011*

Member of *International Biometrics Society (ENAR conference 2011) Program Committee*

Chair of *International Society for Bayesian Analysis and American Statistical Association (Section on Bayesian Statistical Science) Education Committee*

Chair of the *American Statisticians Association (Bayesian Statistical Science) Student Paper Competition Committee*

Member of the *Department Graduate Admissions Committee*

Member of the *Department Instructor Search Committee*

Member of the *Department Preliminary Exam committee for Probability and Statistics*

Member of Editorial Board for *"Journal of the American Statistical Association"*

Member of Editorial Board for *"JASA Reviews"*

Member of Editorial Board for *"Statistica Sinica"*
Special Emphasis Panel member for *NIH-NIGMS Grant Proposal Review* February

Special Emphasis Panel member for *NIH-NIGMS Grant Proposal Review* October

Special Emphasis Panel member for *NIH-NIGMS Grant Proposal Review:* ***Modeling of Infectious Disease Agent Systems (MIDAS)***

Reviewer for *BioMed Central Journal - Infectious Disease*

Reviewer for *Biometrics*

Reviewer for *Fertility and Sterility*

Reviewer for *International Journal of Environmental Health Research*

Reviewer for *Nicotine and Tobacco Research*

Reviewer for *"Paediatric and Perinatal Epidemiology"*

Reviewer for *Statistical Communications in Infectious Diseases*

Reviewer for *Radiology*

Bengt Fornberg

Member of the *Department Graduate Committee*.

Member of the *Department Post Tenure Review Committee*.
Member of *University IGP (The Innovative Grant Program) Review Panel for Physical sciences and Engineering*.

Proposal Reviewer for *proposals for NSF and its counterparts in Sweden, South Africa, Singapore, Saudi Arabia, and Hong Kong*.

Refereed 25 articles for various journals and book publishers.

Keith Julien

Chair of the *Department Primary Unit Evaluation Committee*

Chair of the *Department Instructor Search Committee*

Member of *Department Postdoctoral Program Committee*

Member of *Department Interdisciplinary Computational Science and Engineering Committee*

Chair of *ICSE Subcomittee for Exploration of content for Master and PhD*

Member of *Arts & Science Budget Committee*

Reviewer for *Journal of Fluid Dynamics*

Reviewer for *Physical Review Letters*

Reviewer for *Physics of Fluids*

Congming Li

Chair of the *Department Preliminary Exam committee for Applied Analysis*

Member of the *University of Colorado at Boulder Faculty Assembly*

Editor of *Communication on Pure and Applied Analysis*.

Reviewer for *Discrete and Continuous Dynamical Systems*

Editor of nine articles for *Communications on Pure and Applied Mathematics*.

Reviewer for *Communications on Pure and Applied Mathematics*

Reviewer for *Proceedings of American Mathematical Society*

Reviewer for *Journal of Mathematical Analysis and Applications*

Reviewer for:*Nonlinearity*
Reviewer for *Advances in Mathematics*

Reviewer for *Archive Rational Mech and Analysis*.

Reviewer for *Acta Matematica Scientia*

Reviewer for *Mathematical and Computer Modelling*

Reviewer for *Journal of Differential Equations*

Reviewed proposal for *General Research Fund of Hong Kong*

Manuel Lladser

Member of Program Committee for the *2011 Workshop on Analytic Algorithmics and Combinatorics (ANALCO)*, sponsored by SIAM

Member of *Department Calculus Textbook & On-line Homework Committee*

Member of *Department Preliminary Exam committee for Applied Analysis*

Member of *Department Undergraduate Committee*

Member of *Department Primary Unit Evaluation Committee*

Member of *Colorado Initiative in Molecular Biotechnology (CIMB) Task Force Committee*

Reviewer for *NSF Pan-American Advanced Studies Institutes Program (PASI) grant proposal*

Refereed manuscript for the *Bulletin of Mathematical Biology (Bull. Math. Bio.)*

Refereed manuscript for the *Central European Journal of Mathematics (CEJM)*

Refereed manuscript for the *Electronic Journal of Probability (EJP)*
Refereed manuscript for the *Journal of Statistical Physics (JOSS)*

Refereed seven submissions for the *2011 Workshop on Analytic Algorithmic and Combinatorics (ANALCO)*

Tom Manteuffel

Member of *SIAM Publication Committee*

Member of *SIAM Science Policy Committee*

Consultant to *DOE, Office of Science, Advanced Sceintific Computing Advisory Commettee*.

Consultant to *Advisory Board for Bavarian Graduate School of Computational Engineering*

Consultant to *Advisory Board for Fundamental and Computational Sciences Directorate, Pacific Northwest Laboratory*

Member of *Department Outreach Committee*

Member of *Department Promotion and Tenure Committee*

Member of *Department ICSE Committee*

Member of *Department Postdoctoral Program Committee*

Associate Editor for *Electronic Transactions in Numerical Analysis*

Member of Editorial Board for *Numerical Linear Algebra and Applications*

Editor-in-Chief for *SIAM Journal on Numerical Analysis*

Member of Editorial Board for *SIAM News*
Associate Editor for *Multiscale Modelling and Simulation*, SIAM Press

Member of Editorial Board, *SIAM Journal of Scientific Computing*
Reviewed proposals for DOE

Reviewed proposals for NSF

Reviewer for *Numerical Methods for Partial Differential Equations*

Tom Manteuffel (cont.)

Member of *11th Copper Mountain Conference on Iterative Methods Program Committee*, Copper Mountain, CO, April 4-9

Co-Organizer of *Workshop on Algebraic Multigrid Methods*, Boulder Colorado, October 26-30

Per-Gunnar Martinsson

Member of *Department Postdoctoral Program Committee*

Member of *Department ICSE Committee*

Reviewer for *Applied and Computational Harmonic Analysis*
Reviewer for *BIT Numerical Mathematics*

Reviewer for *Journal of Computational Physics*

Reviewer for *SIAM Journal of Scientific Computation*.
Reviewer for *Elsevier Publishing*

Reviewer for the *European Mathematical Society Publishing House*.

Co-organizer of the *Institute for Mathematics and its Applications (IMA) hot topics workshop*, University of Minnesota

Member of *Low-rank Methods for Large-scale Machine Learning workshop Program Committee* at NIPS (Neural Information Processing Systems) Conference in Vancouver.

Steve McCormick

Member of *Department Retirement Committee*

Member of *Copper Mountain Conference Program Committee*

Reviewed proposals for NSF

Reviewed proposals for DOE

Reviewer for *SIAM journal on Scientific Computing*

Reviewer for *SIAM Journal on Numerical Analysis*

Reviewer for *Journal of Computational Physics*

Reviewer for *AMS Reviews*

Reviewer for *Zentralblatt*

James Meiss

Member of *NSF Review Panel*, March 15-16

Chair of *Department Graduate Committee*

Fellow with *University Center for Integrated Plasma Studies*

Associate Chair of *Graduate Studies in APPM*

Reviewer for *Physica D*

Reviewer for *Nonlinearity*

Reviewer for *Physical Review Letters*

Reviewer for *Chaos (AIP Journal)*

Reviewer for *Physical Review E*

Reviewer for *European Physics Letters*

Reviewer for *SIAM Journal on Dynamical Systems*

Reviewer for *Mathematics & Computing in Simulation*

Reviewer for *New Journal of Physics*

Reviewer for *Foundations of Computational Mathematics*

Reviewer for *Physica Scripta*

Editorial Board Member with *SIAM Books*

Book Proposal Reviewer for *De Gruyter Publishing*

Book Proposal Reviewer for *Birkhäuser Boston Publishing*

Mary Nelson

Supervised *undergraduate Noyce Fellowship students*

Co-course coordinator, Fall *APPM 1350*

Member of *Department Textbook Selection Committee*

Faculty Participant in *CU Math Day*, April 6

Mentored three instructors

Department Representative at *University Learning Assistant orientation*

Evaluator on *College Project Grant*, "One Day's Pay,"

Participant in *Colorado LAtest project DBER (Discipline Based Educational Research) portion*

Participant in *CU Teach program*

Reviewer for *Frontiers in Education*

Reviewer for *Journal of Engineering Education*

Adam Norris

Member of the *Department Undergraduate Committee*

Course Coordinator, *APPM 2350*

Faculty Adviser for *professional engineering fraternity Theta Tau*

Department Respresentative at *College of Engineering New Student Orientation*.

Department Representative at *Engineering Sampler*

Departmental liaison to *ASSETT (A & S Support of Education Through Technology)*

Department Representative at *High School Honors Institute*

Boulder Faculty Assembly representative to the *CU Administrative Services and Technology Committee*

Boulder Faculty Assembly representative to the *Chancellor's Committee on Program Accessibility.*

Boulder Faculty Assembly *non-tenure at-large representative*.

Departmental liaison to *University Honor Council*

Member of *Boulder Faculty Assembly's CU Administrative Services and Technology Committee*.

Department representative for *University Arts & Sciences Council*.

Member of *Arts and Sciences Council Grievance Committee*

Reviewer for *SIAM Undergraduate Journal*

Juan Restrepo

Member of the *Department Graduate Committee*

Member of the *Department PDE Preliminary Exam Committee*

Reviewer for *Physica D*

Reviewer for *Physical Review Letters*

Reviewer for *Physical Review E*

Reviewer for *European Physics Letters*

Reviewer for *Chaos*

Reviewer for *Journal of Vibration and Acoustics*

Harvey Segur

Member of *Department Program Review Panel (PRP) Committee*

Reviewer for *Journal of Fluid Mechanics*

Reviewer for *Physical Review Letters*

Reviewer for *Physica D*

Reviewer for *Physical Review E*

Reviewer for *Proceedings of the Royal Society of London*

Reviewer for *Archives of Rational Mechanics & Analysis*

Reviewer for *SIAM Journal of Applied Mathematics*

Reviewer for *Science Foundation of Ireland*

Tiejun Tong

Reviewer for *Mathematical Reviews,*

Member:of *The 3rd International Conference on BioMedical Engineering and Informatics (BMEI 2010) Program Committee*; Yantai, China; October

Member of the *Department Graduate Committee*

Member of *Journal of Biometrics and Biostatistics Editorial Board*

Member of InterStat Editorial Board

Reviewer for *Computational Statistics & Data Analysis*

Reviewer for *Australian & New Zealand Journal of Statistics*

Reviewer for *Statistica Sinica*.

Department of Applied Mathematics 2010 Annual Report
Faculty Outreach

Outreach activities help to share the enthusiasm and knowledge of a department with others. The department is involved in various outreach activities. By aligning MCTP funds the department has engaged in the on campus Digital Currents Program, Sophia Math, and the College of Engineering's High School Honors Institute. Through the CCLI project grant (Mary Nelson-PI) the department is working with the Boulder Valley School District to get students to "Do More Math. Other outreach includes Colorado Math Circle. Applied Mathematics prides itself on the strength and vigor of its Instructors, who carry on most of our outreach work.

Senior Instructor Anne Dougherty and Professor Congming Li work intimately with the Colorado Math Circle. The CMC provides enrichment opportunities for advanced high school and middle school students through math talks and problem-solving sessions. The CMC Director is Silva Chang. There are 1-2 meetings held each month during the academic year. Monthly average attendance was thirty-five students, drawn from twenty-nine different schools and twenty-four different towns in Colorado.

Some of Mary Nelson's outreach work associated with CCLI includes consulting with a middle school teacher at Century Middle School on how to use oral assessments, and then participating in the oral assessments for her class, teaching three probability sessions for middle school students from Angevine Middle School, and facilitating oral assessments for a class of Algebra students at Centaurus High School. Research suggests that participating in oral examinations significantly increases student success on written examinations, and correlates strongly with long-term retention of the material.

Adam Norris is also involved with department efforts to increase interest and skill with mathematics in pre-College students. He has presented activities demonstrating agent-based modeling and basis behaviors to students from the Alexander Dawson School and Angevine Middle School. At the University level, Adam epresented APPM at the High School Honors Institute, the Engineering Sampler, the Explore CU Engineering events, the college-wide Advising Fair, **GEEN 1500**: *Introduction to Engineering*, and orientation for new freshman Engineering students.

Department of Applied Mathematics 2010 Annual Report
Teaching Activities

Mary Nelson Met four hours a week both semesters with learning assistants for GEEN 1350 and 1360 to insure that they were well prepared for workshops.

Mary Nelson Spring 10: organized and wrote the questions for oral assessments for all Calculus II students (offered to 450+ students), and analyzed the results

Fall 10: organized and adapted the questions for oral assessments for all Calculus I students (offered to 600+ students), and then analyzed the results. Trained facilitators.

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Undergraduate Courses Taught by Department Personnel

Spring Semester

APPM 1345	*Silva Chang*	*Calculus 1B with Algebra*
APPM 1350	*Ann Scheels*	*Calculus I for Engineers*
APPM 1360-020	*Mary Nelson*	*Calculus II for Engineers*
APPM 1360-030	*Ann Scheels*	*Calculus II for Engineers*
APPM 1360-040	*Anne Dougherty*	*Calculus II for Engineers*
APPM 1720-001	*John Flynt*	*Introduction to Games Development 2*
APPM 2350-010	*Mary Nelson*	*Calculus III for Engineers*
APPM 2350-020	*Adam Norris*	*Calculus III for Engineers*
APPM 2350-030	*Christopher Curtis*	*Calculus III for Engineers*
APPM 2360-010	*Yi Zhu*	*Introduction to Ordinary Differential Equations with Linear Algebra*
APPM 2360-020	*David Bortz*	*Introduction to Ordinary Differential Equations with Linear Algebra*
APPM 2360-030	*Sujeet Bhat*	*Introduction to Ordinary Differential Equations with Linear Algebra*
APPM 2360-040	*Christopher Curtis*	*Introduction to Ordinary Differential Equations with Linear Algebra*
APPM 2450	*Graduate Students*	*Calculus III Lab*
APPM 2460	*Graduate Students*	*Differential Equations Lab*
APPM 3050	*Adam Norris*	*Scientific Computing in Matlab*
APPM 3310	*Sujeet Bhat*	*Matrix Methods*
APPM 3570	*Tiejun Tong*	*Applied Probability*
APPM 4360	*Harvey Segur*	*Complex Variables*
APPM 4390	*David Bortz*	*Modeling in Mathematical Biology*
APPM 4450	*Anne Dougherty*	*Undergraduate Applied Analysis*
APPM 4540	*Corcoran, Jem*	*Introduction to Time Series*
APPM 4570	*Amy Biesterfeld*	*Statistical Methods*
APPM 4660	*Geoffrey Sanders*	*Intermediate Numerical Analysis 2*

Summer - Term C

APPM 1350		*Calculus I for Engineers*
APPM 1360	*Sujeet Bhat*	*Calculus II for Engineers*
APPM 2350-300		*Calculus III for Engineers*
APPM 2350-301		*Calculus III for Engineers*
APPM 2360-300		*Introduction to Ordinary Differential Equations with Linear Algebra*
APPM 2360-301		*Introduction to Ordinary Differential Equations with Linear Algebra*
APPM 2450		*Calculus III Lab*
APPM 2460		*Differential Equations Lab*
APPM 3310		*Matrix Methods*
APPM 4650	*Adam Norris*	*Intermediate Numerical Analysis 1*

Fall Semester

APPM 1340	*Silva Chang*	*Calculus 1A with Algebra*
APPM 1350-010	*Mary Nelson*	*Calculus I for Engineers*
APPM 1350-020	*Anne Dougherty*	*Calculus I for Engineers*
APPM 1350-030	*James H. Curry*	*Calculus I for Engineers*
APPM 1350-040	*Amy Biesterfeld*	*Calculus I for Engineers*
APPM 1350-050	*Christopher Curtis*	*Calculus I for Engineers*
APPM 1360-010	*Sujeet Bhat*	*Calculus II for Engineers*
APPM 1360-020	*Sujeet Bhat*	*Calculus II for Engineers*
APPM 1360-030	*Congming Li*	*Calculus II for Engineers*
APPM 1710	*John Flynt*	*Programming and Simulation Development 1*
APPM 2350-010	*Mary Nelson*	*Calculus III for Engineers*
APPM 2350-020	*Christopher Curtis*	*Calculus III for Engineers*
APPM 2350-030	*Adam Norris*	*Calculus III for Engineers*
APPM 2350-040	*Patrick Young*	*Calculus III for Engineers*
APPM 2360-010	*Kristine Snyder*	*Introduction to Ordinary Differential Equations with Linear Algebra*
APPM 2360-020	*Keith Julien*	*Introduction to Ordinary Differential Equations with Linear Algebra*
APPM 2360-030	*Keith Julien*	*Introduction to Ordinary Differential Equations with Linear Algebra*
APPM 2450	*Graduate Students*	*Calculus III Lab*
APPM 2460	*Graduate Students*	*Differential Equations Lab*
APPM 3170	*Manuel Lladser*	*Discrete Applied Mathematics*
APPM 3310-001	*Sujeet Bhat*	*Matrix Methods*
APPM 3310-002	*Yi Zhu*	*Matrix Methods*
APPM 4350	*Mark J. Ablowitz*	*Methods in Applied Math I (Fourier Series)*
APPM 4380	*Juan Restrepo*	*Modeling in APPM*
APPM 4440	*Anne Dougherty*	*Undergraduate Applied Analysis*
APPM 4520	*Jem Corcoran*	*Introduction to Mathematical Statistics*

APPM 4560	*Jem Corcoran*	*Markov Processes*
APPM 4650	*Adam Norris*	*Intermediate Numerical Analysis 1*
APPM 4720	*Adam Norris*	*Honors Advanced Calculus for Engineers*
APPM 4950	*Adam Norris*	*Seminar in Applied Mathematics*

Graduate Courses Taught by Department Personnel

Spring Semester

APPM 5360	*Harvey Segur*	*Complex Variables*
APPM 5390	*David Bortz*	*Modeling in Mathematical Biology*
APPM 5450	*Per-Gunnar Martinsson*	*Applied Analysis 2*
APPM 5460	*James Meiss*	*Dynamical Systems/Differential Equations/Chaos*
APPM 5540	*Jem Corcoran*	*Introduction to Time Series*
APPM 5570	*Amy Biesterfeld*	*Statistical Methods*
APPM 5610	*Gregory Beylkin*	*Numerical Analysis 2*
APPM 7400-001	*Tiejun Tong*	*Advanced Topics in Statistics*
APPM 7400-005	*James Meiss*	*Topics - Operations Research*

Fall Semester

APPM 5350	*Mark J. Ablowitz*	*Methods in Applied Math I (Fourier Series)*
APPM 5380	*Juan Restrepo*	*Modeling in APPM*
APPM 5430	*Mark J. Ablowitz*	*Advanced Complex Variables*
APPM 5440	*Manuel Lladser*	*Applied Analysis I*
APPM 5470	*Congming Li*	*Methods of Applied Mathematics 3: PDEs*
APPM 5520	*Jem Corcoran*	*Introduction to Mathematical Statistics*
APPM 5560	*Jem Corcoran*	*Markov Processes*
APPM 5600	*Tom Manteuffel*	*Numerical Analysis I*
APPM 7100	*James Meiss*	*Dynamical Systems*
APPM 7400-002	*Gregory Beylkin*	*Wavelets & Imaging*
APPM 7400-003	*Jem Corcoran*	*Advanced Topics - Stochastic Differential Equations*
APPM 7400-004	*Anne Dougherty*	*Seminar - Teaching Excellence*

Courses Offered by the Department, Taught by Non-Departmental Personnel

APPM 2750	*Fall 2010*	*Catherine Bishop, Interdisciplinary Telecommunications*	*Java II/Applied Java*
APPM 4120	*Spring 2010*	*Alejandro Spina, Mathematics*	*Operations Research*
APPM 4520	*Spring 2010*	*Robert Goodrich, Mathematics*	*Introduction to Mathematical Statistics*
APPM 4570	*Fall 2010*	*Jeffrey Luftig, Engineering Mgt*	*Statistical Methods*
APPM 4580	*Spring 2010*	*Jeffrey Luftig, Engineering Mgt.*	*Statistical Methods of Data*
APPM 4650	*Spring 2010*	*Alejandro Spina, Mathematics*	*Intermediate Numerical Analysis 1*

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