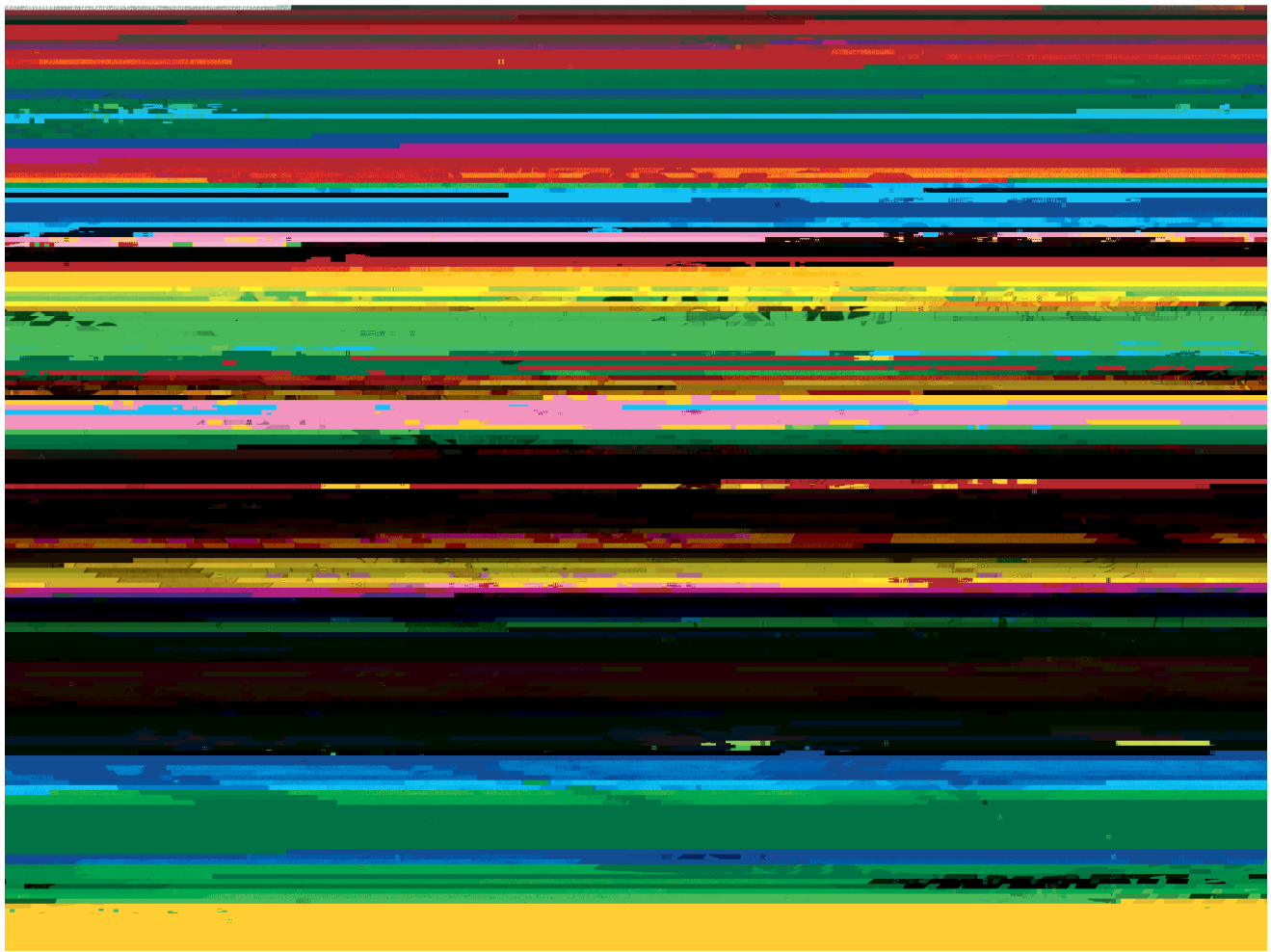
Department of Applied Mathematics

Annual Report 2010



University of Colorado at Boulder

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.

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.

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 udents*

VWPÀU

Afþliated Faculty

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.

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

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

- A
  . 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 . 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

2001	5,435	22/57	66	29

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 signi fcant 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, f fteen 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

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.

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.

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 '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.

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.

Bachelorõs 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

Eric Greenwald
Matanya Horowitz
Benjamin Palin
Timothy Schiesswohl

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

Masterõs 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

Stephen Chestnut
Jerrad Hampton

Jason DeSalvo
Adam Fox
Nathan Halko
Owen Lewis

Doctoral Degrees

Jinyu Li

Min Ho Park
Lei Tang
Patrick Young

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

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

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

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

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

– Research Associate; PhD, University of Colorado at Denver. *Multigrid Methods, Scalable Algorithms, Parallel Computing.*

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

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

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

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

– Associate Professor; PhD,

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Affliated Faculty

– Colorado Research Associates

– Aerospace Engineering, Electrical Engineering

– Physics

– Computer Science

– Computer Science

Xiao-Chuan Cai – Computer Science

– Physics

– Physics

– Physics

– Aerospace Engineering

– College of Business

– Laboratory for Atmospheric and Space Physics (LASP)

– Institute for Mathematics Applied to Geosciences

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

– College of Business

– Computer Science

– Physics

– Civil, Environmental, and Architectural Engineering

– Institute of Arctic and Alpine Research (INSTAAR)

– Chemical and Biological Engineering

– Environmental Science and Engineering Division, Colorado School of Mines

– Computer Science

Laskshmi Kantha – Aerospace Engineering

– Mechanical Engineering

– Chemical and Biological Engineering

Manuel Laguna – College of Business

Michael Lightner – Electrical Engineering;

– Computer Science

– Electrical and Computer Engineering

– Aerospace Engineering

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

Lev Ostrovsky – National Oceanic and Atmospheric Administration (NOAA)

– Aerospace Engineering

– Physics

– National Center for Atmospheric Research (NCAR)

– Civil, Environmental, and Architectural Engineering

– Institute for Mathematics Applied to Geosciences

– Chemical Engineering

– Aerospace Engineering

– Astrophysical and Planetary Sciences (APS)

– Chemistry

– Institute for Arctic and Alpine Research (INSTAAR)

– Astrophysical and Planetary Sciences (APS)

– Computer Science

– Mechanical Engineering

– Atmospheric and Oceanic Sciences

– Mechanical Engineering

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

– Colorado Research Associates

– Director of Operations

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. *seme*

11/30/10	, Department of Applied Mathematics, University of Colorado at Boulder	*Flow past an airfoil via conformal mapping*
12/07/10	, 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	, Department of Mathematics, Hong Kong University of Science and Technology	*A New Picard-Type Theorem Associated with Q-Special Functions*
02/09/10	, Department of Aerospace Engineering Sciences, University of Colorado at Boulder	*Shock and Turbulence Regularization in Euler Equations: Derivation from Basic Principles*
03/17/10	, Department of Applied Mathematics, University of California at Merced	*Dynamics of Nonlinear Bound States in Inhomogeneous Media*
04/06/10	, Department of Mathematics, University of Ioannina, Greece	*Excited Bose-Einstein Condensates: Dark Solitons and Quadrupole Oscillations*
04/20/10	, Department of Mathematics, University of Ioannina, Greece	*The Short Pulse Equation and Its Variants*
05/05/10	, 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	, Department of Applied Mathematics, University of Colorado at Boulder	*Period-Two Spatiotemporal Dynamics of Intracellular Calcium*
01/21/10	, Department of Applied Mathematics, University of Colorado at Boulder	*Transitory Dynamical Systems*
01/28/10	, Department of Aerospace Engineering Sciences, University of Colorado at Boulder	*A Fluid Cooperative Control Technique for Aerial and Underwater Sensor Networks*
02/04/10	, Department of Physics, Colorado State University	*Excitation of Chaotic Surface Spin Waves in Magnetic Thin Film-based Active Feedback Ring*
02/11/10	, Department of Physics, University of Colorado at Boulder	*Hamiltonian Monodromy and the Resonant Elastic Pendulum*

02/18/10	**,** Department of Mathematics, Rutgers University	*Computation of Connecting Dynamics by Parameterization of Invariant Manifolds*
02/25/10	**,** National Institutes of Health/National Institute of Mental Health (NIH/NIMH)	*Phase Transitions and Stimulus Processing in the Brain*
03/04/10	**,** 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	**,** Department of Mathematics, Vrije University, Amsterdam	*Ghost Circles in Lattice Aubry-Mather Theory*
03/18/10	**,** 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	**,** Departmentof Mathematics, University of Colorado at Colorado Springs	*Autoregulation Mechanisms in Complex Networks*
04/22/10	**,** Ecole Normale Supérieure, Paris	*Spatial Structures in Chaotically Advected Chemical Fields: The Role of a Delay Time*
09/02/10	**,** Department of Applied Mathematics, University of Colorado at Boulder	*Spatiotemporal Dynamics of Calcium-Driven Alternans in Cardiac Tissue*
09/09/10	**,** Department of Computer Science, University of Colorado at Boulder	*The Trouble with CommFields: Strww Þ e] A _ q DynamicsFields: Dynamics*
09/23/10	**,** Department of Applied Mathematics, University of Colorado at Boulder	
09/30/10	**,** Department of Applied Mathematics, University of Colorado at Boulder	
10/07/10	**Lincoln Carr**, Department of Physics, Colorado School of Mines	
10/14/10	**Daniel Larremore**, Department of Applied Mathematics, University of Colorado at Boulder	
10/21/10	**,** Department of Atmospheric and Oceanic Sciences, University of Colorado at Boulder	
10/28/10	**,** NSF Computing Innovations Fellowship at the University of Colorado	

11/04/10 , Department of Mathematics, Colorado *Fr* ,
State University

11/18/10 , Department of Mathematics,
Imperial College, London

12/02/10 , Department of Applied Mathematics,
University of Colorado at Boulder

04/02/10	, Senior Research Scientist, Adobe Systems, Inc.	*Climate the and and PatchMatch: A Randomized Correspondence Algorithm for Structural Image Editing*
04/23/10	, Department of Physics, Washington University at St. Louis	*Making Sense of Non-Hermitian Hamiltonians*
08/27/10	, Department of Mathematics, North Carolina State University	*Model Development and Control Design for High Performance Nonlinear Smart Material Systems*
09/03/10	, 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	, College of Engineering, University of California at Santa Barbara	*Dissipation-Induced Instabilities in Nature and Mathematics*
09/17/10	, Department of Mathematics, Purdue University	*Phase-Field Models for Multiphase Complex Fluids: Modeling, Numerical Analysis and Simulations*
09/24/10	, Mathematical Biosciences Institute, Ohio State University	*Animal Gaits and Symmetries of Periodic Solutions*
10/01/10	, Department of Aerospace Engineering Sciences, University of Colorado at Boulder	*Uncertainty Quantiþcation: Towards Predictive Computational Modeling*
10/08/10	**Baylor Fox-Kemper**, Cooperative Institute for Research in Environmental Sciences (CIRES)	*Whatõs Lurking at the Subgrid Scale in Ocean Climate Models?*
10/15/10	, Department of Chemistry and Biochemistry, University of Colorado at Boulder	*History and Future of CU-Boulderõs Newest Institute: RASEI and Prospectus on Creating a Solar Fuels Industry*
10/22/10	, Department of Computer Science, University of Colorado at Boulder	*Solar and Algebraic Invariant Synthesis for Hi ļ Gaits Lurking and Climate d Hi ļ d ofP Ļ Ţ Future and of Solar*
10/29/10	, Department of Mathematics, Davidson College	*History and*
11/05/10	, Joint Institute for Laboratory Astrophysics (JILA)	
11/12/10	, Department of Physics, Northeastern University	
11/19/10	, Jayaraman Group, University of Colorado at Boulder	
12/03/10	**Eric Shea-Brown**, Department of Applied Mathematics, University of Washington	

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

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 affliated disciplines. Affliated faculty working with Applied Math undergraduates

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.

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.

Air Force Office of Scientific Research (AFOSR),
Nonlinear Wave
Propagation
2008-2011

Nonlinear Wave Motion
2006-2010

Nonlinear Wave Motion
2009-2012

Co-PI on:

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

Colorado Math Circle
PI: Silva Chang
Co-PI: C. Li

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

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

Co-PI on:

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

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

Radial Basis Functions
2006-2011

Co-PI on:
Department of Defense - Army Research Office (DOD-

Radial Basis Functions
2009-2012

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

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

Modeling Magneto-Inertial-Gravity waves in the Lower Convection Zone
2006-2011

Co-PI on:

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

Models of Balanced Multiscale Ocean Physics for Simulation and Parameterization
2009-2012
Co-PIs: B. Fox-Kemper, J. Weiss

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

Congming Li

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

Co-PI on:

Colorado Math Circle

PI: Silva Chang
Co-PI: A. Dougherty

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

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

Per-Gunnar Martinsson

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

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

Geometric and Algebraic Multigrid Methods for QCD, MHD, Elasticity, Transport, and Other DOE Applications
2007-2011

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

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

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

Nonlinear Dispersive Waves with Weak Dissipation
2007-2011

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

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

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

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

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

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

Spectral stability of stationary solutions of a Boussinesq system describing long waves in dispersive media” *SIAM Journal onApplied Dynamical Systems* *pp 999ð1018*

Invited Discussion of “Association Tests that Accommodate Genotyping Uncertainty” *Bayesian Statistics*, *pp.*

Towards adaptive smoothed aggregation (αSA) for nonsymmetric problems" *SIAM Journal on Scientiþc Computing* *pp. 14-39*

Smoothed aggregation multigrid for Markov chains" *SIAM Journal on Scientiþc Computing* *pp. 40-61*

First-Order System Least Squares for Incompressible Resistive Magnetohydrodynamics" *SIAM Journal on Scientiþc Computing* *pp. 229ð248*

Least-squares fnite element methods for quantum electrodynamics" *SIAM Journal on Scientiþc Computing* *pp. 398-417*

"Algebraic multigrid for Markov chains" *SIAM Journal on Scientiþc Computing* *pp. 544-562*

Nested iteration and frst-order system least squares for incompressible, resistive magnetohydrodynamics" *SIAM Journal on Scientiþc Computation* *pp. 1506-1526.*

Weighted Least-Squares Finite Elements for Particle Imaging Velocimetry Analysis" *Journal of Computational Physics* *pp. 107-118*

Further results on error estimators for local refnement with frst-order system least squares (FOSLS)" *Journal of Numerical Linear Algebra Applications* **vol 17, iss. 2-3** *pp 387-413*

Operator-based interpolation for bootstrap algebraic multigrid" *Journal of Numerical Linear Algebra Applications* **vol. 17, iss. 2-3** *pp 519-537*

Finite elements for quantum electrodynamics using a Helmholtz decomposition of the gauge feld" *Journal of Numerical Linear Algebra Applications* **vol. 17, iss. 2-3** *pp. 539-556*

Towards adaptive smoothed aggregation (α

"Comparing Multiple Test Treatments to Both Positive and Negative Controls"
Journal of Statistical Planning and Inference *pp. 180-188*

"A Survey of Statistical Software for Analyzing RNA-seq Data"
Human Genomics *pp. 56-60*

"Analyzing Breast Cancer Microarrays of African Americans Using Shrinkage-based Discriminant Analysis" *Human Genomics* *pp. 5-16*

"Bias-corrected Diagonal Dis-criminant Rules for High-Dimensional Classi f cation" *Biometrics* *pp. 1096-1106*

Invited Lectures and Meetings Attended

The department of Applied Mathematics is f lled 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 scienti f c process - below we list the locations around the globe that our faculty have given and received shared knowledge.

"Nonlinear Approximations in Scienti f c Computing"
March 3

"Full wave equation depth extrapolation for migration"

“Tracking Flu Epidemics using Google Flu Trends and Particle Learning”

Spring

“Tracking Flu Epidemics using Google Flu Trends and Particle Learning”

Spring

“Tracking Flu Epidemics using Google Flu Trends and Particle Learning”

Spring

“SCIS population models for spread of CA-MRSA in Chicago”
National Scientiþc MIDAS
Spring

“Bayesian Ranking and GWAS Uncertainty”
; Summer 2010:
“Bayesian Modeling of Smoking in Pregnancy” *(poster)*
;
Summer

Bayesian Multiresolution Hazard Modeling, with Application to Breast Cancer Recurrence”

Autumn

“Bayesian Modeling of Smoking Metabolism”

Autumn

“Population modeling for bacterial meningitis in sub-Saharan Africa”

Autumn

Manuel Lladser

“Period-two spatiotemporal dynamics of intracellular calcium’’

January

“The dynamic range in networks of coupled excitable systems”

workshop, Center for Scientiþc

April

“How network topology affects dynamic range of neural networks”;

May

‘’The dynamic range in networks of coupled excitable systems’’

May

“The modulational instability in water waves”

March 26-30

“The modulational instability, in deep water and elsewhere”

May 17-21

“Waves in shallow water”

June 10-14

“The modulational instability, in water waves and elsewhere”

June 13-18

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

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*

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

Member of the *National Research Council Fellowships Ofþce 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*.

Committee. 6WDW@

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 *òJournal 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*

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:*Nonline* *and Mathema*

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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 Scientiþc 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.

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 Scientiþc Computing*

Reviewer for *SIAM Journal on Numerical Analysis*

Reviewer for *Journal of Computational Physi đ*

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*

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 *C-ис M Sci Commpport*

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 M

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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Scientiþc

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