

**Department of
Applied
Mathematics
Annual Report 2014**



**Applied Mathematics
25 Years of
Excellence**

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

Department of Applied Mathematics 2014 Annual Report

Overview

Applied Mathematics is central to science and engineering education. As early as 1901 Engineering Mathematics was taught by faculty in the College of Engineering. Engineering Mathematics was organized as a separate Department of Engineering Mathematics in 1901. In 1948 the name of the unit was changed to the Department of Applied Mathematics and the Department granted its first Masters Degrees in that year as well. In 1958 it graduated its first BS degrees in Applied Mathematics. Soon afterwards, in 1962, the PhD degree in Applied Mathematics was approved by the Regents. In 1966 with hiring of S. Ulam by the Mathematics Department, the Applied Mathematics Department in the College of Engineering and Mathematics Department in the College of Arts and Sciences merged. The two departments were joined from 1966 until 1989.

In 1989, following a meeting of a number of faculty and administrators in the Sciences and Engineering, a recommendation was made to establish an independent Program in Applied Mathematics (APPM). The program was organized within the College of Arts and Sciences and was given authority to grant BS, MS and Ph.D degrees in Applied Mathematics. After 1989 APPM began a remarkable period of development; in 1996 the Regents approved changing its title to Department of Applied Mathematics. Thus with the reemergence of this independent Program in 1989, APPM has now reached its 25 anniversary.

Instrumental faculty in the mid-1980s were Professors James Curry and Robert Easton who helped form an important committee with a vision to develop a new programmatic effort in Applied Mathematics. Early views were that the program would be housed in the Graduate School with faculty rostered in various departments; this would have been similar to how institutes were organized. In 1988 the committee recommended that Mark Ablowitz be hired as the first Director of the Program in Applied Mathematics. By the time Ablowitz arrived on campus in July 1989 to assume the position of Director, faculty committees had recommended that the Program be housed in the College of Arts and Sciences (A&S) where it is today. This supports the view that via A&S the Department can support engineering, science, and mathematics, as well as many other fields of application. In the early 1990s APPM began an affiliated faculty effort, where an affiliated faculty member from another department can direct a PhD student in conjunction with a co-advisor from APPM.

From 1989 to 2000 Ablowitz was the first Director and subsequently became Chair of the Department. From 2000-2003, Professor Harvey Segur was Chair and from 2003-2012 Professor James Curry was Chair. Ablowitz is serving as Chair 2012-present.

In 1989 the task of building the newly created program was given to Ablowitz and his colleagues. The program originally had one staff member, Janet Horn. In addition to Ablowitz and Curry, two key faculty members, Jim Meiss and Harvey Segur, were appointed beginning Fall 1989. Soon after the program was formed a number of faculty moved from the Mathematics Department to APPM; this included Professors Jerold Beberness, Robert Easton, John Maybee and John Williamson. Thus the original four faculty along with the four that moved from the Math Department plus key new faculty who were hired the early-mid 1990s: Professors Beylkin, Li, Manteuffel, McCormick and Fornberg, formed the core of the unit and collaborated on shaping its future. Over time the current structure of the undergraduate and graduate curricula were developed.

In addition to hiring tenure track faculty the Program also hired two instructor/postdoctoral researchers, who typically spend three years with the unit before moving on to permanent, typically tenure track faculty positions. In the mid-1990s one of the people hired was Dr. Anne Dougherty. Anne, a remarkable teacher and advisor, decided she preferred to remain with APPM as a senior instructor. Over time, she made improvement of APPMs undergraduate program a priority. She became our Associate Chair during Professor Curry's term as Chair. She has been extremely influential in our teaching and service missions ever since.

During the past few years, APPM's teaching obligations have increased significantly. This is largely due to the decision by the College of Engineering to substantially increase its overall undergraduate enrollment. APPM is in a growth phase once again. Last year the Department hired two new faculty members: Stephen Becker and Mark Hofer, and is again gearing up to recruit a new faculty member beginning fall semester 2015. We are looking forward to the future with high expectations and excitement.



Dr. Mark J. Ablowitz **Dr. Anne Dougherty**
Department Chair Associate Chair





Department of Applied Mathematics 2014 Annual Report

Departmental Activities

Undergraduate Education

The Department of Applied Mathematics in the College of Arts and Sciences offers courses and degree programs for undergraduates and graduate students. The Department of Applied Mathematics currently has 16 full-time faculty, several instructors and post-doctoral associates, and maintains an active Visitor Program with researchers from around the world. Courses range from calculus to seminars in computation, discrete mathematics, probability and statistics, nonlinear phenomena, mathematical biology, and physical applied mathematics.

The undergraduate program in AMEN prepares graduates to practice effectively in the field of mathematics, or to further their careers through advanced study. The principle focus of a major in applied math is to improve a student's mathematical, computational, and communication skills. The focus is on modeling problems from a variety of areas including business, engineering and science.

In 2013, in order to address the challenges posed by major increases in undergraduate enrollment, as well as an ongoing space crisis on the Boulder campus, the Department of Applied Mathematics began utilizing a "help room" - a large single room space to accommodate office hours for department TAs, allowing more students to receive course assistance at once while not overcrowding the TA shared office spaces. In 2014, the department moved from a single help room in ECCR 211 to two help rooms in ECCR 244 and STAD 262A/B. Hard data on increases in office hour attendance and satisfaction are unavailable for 2013-2014, but anecdotally, the help rooms appear to be a success.

Applied Mathematics continued to offer additional sections in our lower division courses for Engineering Honors and Goldshirt Residential Academic Program (RAP) students for our Calculus courses in 2014. These sections, made possible by funds from the Engineering Honors RAP, are smaller, allowing students to get more individualized interactions with their professor, and are located in or near the Andrews Hall dormitory, home of the two programs. Popular with both students and faculty, the Sustainable By Design RAP has made inquiries about offering a similar section for their students in the Spring 2015 term.

The art of creating and testing mathematical models of real-world problems is an important part of our undergraduate training. Undergraduate students are given an opportunity to showcase their mathematical, computational and communication skills in the annual Mathematical Contest in Modeling, (MCM) an international contest sponsored by COMAP (The Consortium for Mathematics and its Applications). Students from all science, math and engineering majors are encouraged to enter. Held in February, the contest saw three teams from Applied Mathematics participating. One team was awarded a "Meritorious" ranking.

Graduate Education

The department offers four formal interdisciplinary programs, three 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>
- The University's **IQ Biology** interdisciplinary program. The IQ Biology program offers a mix of core classes, research projects and professional development experiences. These are all designed to help you work collaboratively across disciplines to solve problems. Other departments participating in IQ Biology include Chemistry & Biochemistry; Ecology and Evolutionary Biology; Molecular, Cellular and Developmental Biology; Computer Science; and Mechanical Engineering.

Enrollment Statistics

Applied Mathematics has seen a steady increase in undergraduate enrollments over the past five years, growing from a total of 2,036 undergraduates taking APPM courses in Fall 2009 to 2,723 undergraduates in Fall 2014. The largest growth has been in our lower division courses, as the College of Engineering as a whole has increased recruitment efforts and the department's own Pre-Calculus course has now been offered in both the Fall and Spring Semesters. Lower division course enrollment increased by 4.5% between Fall 2013 and Fall 2014. While this is a lower absolute increase than the 15% between Fall 2012 and Fall 2013, it still represents nearly 2,400 students enrolled in only five courses in one semester (APPM lab enrollments are students already enrolled in other APPM courses, they do not increase the absolute count).

Unfortunately, students are also increasingly unprepared for the courses they enroll in. Of 877 students enrolled in APPM 1350 in the Fall of 2014, 280 did not successfully complete the course - 32% of students. Last Fall Semester, "only" 23% of APPM 1350 students received a grade below the minimum C- required to advance. The department increases efforts to help students outside of the classroom, with increased seating in Calculus workgroups, increased oral examinations, and the addition of dedicated help rooms.

Lower Division Enrollments By Semester

Course #	Cred	Enrollment	Enrollment	Enrollment	Enrollment	Enrollment	Enrollment	Course #	Cred	Enrollment	Enrollment	Enrollment	Enrollment	Enrollment	Enrollment
		141	131	121	111	101	091			147	137	127	117	107	097
1235	4.0	60	N/A	N/A	N/A	N/A	N/A	1235	4.0	190	240	N/A	N/A	N/A	N/A
1340	3.0	14	33	N/A	N/A	N/A	N/A	1340	3.0	39	26	80	97	38	65
1345	3.0	26	73	74	48	46	61	1345	3.0	N/A	12	N/A	N/A	N/A	N/A
1350	4.0	323	161	154	135	123	128	1350	4.0	877	743	610	572	527	507
1360	4.0	646	507	435	379	396	399	1360	4.0	378	311	320	303	291	342
1710	3.0	N/A	N/A	18	14	N/A	N/A	1710	3.0	N/A	N/A	N/A	19	22	16
1720	3.0	N/A	N/A	N/A	N/A	11	17	2350	4.0	526	402	411	367	352	330
2350	4.0	248	252	252	235	303	323	2360	4.0	425	376	335	326	306	255
2360	4.0	428	452	436	411	378	430	2450	1.0	91	84	91	99	100	78
2450	1.0	68	79	86	85	64	93	2460	1.0	89	96	93	96	72	94
2460	1.0	83	94	80	77	92	99								
Total:		1896	1651	1535	1384	1413	1550	Total:		2615	2290	1940	1879	1708	1687

Upper Division Enrollments: Spring Semester

Course #	Cr	CEN	CEN	CEN	CEN	CEN	CEN	
#	Hrs	141	131	121	111	101	091	
3050	3.0	99	88	84	98	83	69	
3310	3.0	108	142	111	57	58	62	
3570	3.0	108	121	89	93	93	81	
4120	3.0	20	18	11	CANC	27	19	Sponsored by MATH in 2141
4360	3.0	78	63	44	65	61	43	
4390	3.0	5	13	7	8	15	8	
4450	3.0	17	10	7	10	7	5	
4520	3.0	35	34	37	36	44	27	Sponsored by MATH in 2141
4540	3.0	15	20	30	8	26	11	
4570	3.0	24	33	37	35	38	40	
4570	3.0	9	11					new for 2131
4580	3.0	9	7	6	11	10	10	EMEN is sponsor Also meets with TLEN 5750-001
4590	3.0	4						
4650	3.0	17	16	19	15	15	16	Sponsored by MATH in 2141
4660	3.0	30	22	17	25	18	31	APPM is sponsor
4720/5720	3.0	1						
4720	3.0	5	3	4	9	CANC	4	FNCE is sponsor
4950	3.0	9	17	5	4	CANC	CANC	



Department of Applied Mathematics 2014 Annual Report Graduating Students

May

Matthew Beale
Dushyant Dhundara
Dillon Fancher
Tyler Gordon
Mackenzie Green
Brad Hendershott
Stephen Krupansky
Emma Mossinger
Joseph Parks
Zachary Sajevic
Whitney Sather
Dana Schnee
Vladislav Soukhovei
Rebecca Stewart
Jeremy Upsal

August

Kylie Hurd
Shaun Starbuck

December

Justin Baacke
Tracy Babb
Matthew Green
Alexander Mitkus
Katherine Peters
Fiona Pigott
Ilana Trumble
Teng Wang

Bachelor's Degrees

Master's Degrees

Christopher Aicher (BS/MS)
Meng Cao
Yan Chen (BS/MS)
Amanda Crawford
Kerry Garcia
Stephen Kissler (BS/MS)
Warren Lord
Richard Shafer
Dan Wu

Brita Schneiders
Thomas Trantow (BS/MS)

Jeffery Allen
Christopher Ryan
Anna Broido

Doctoral Degrees

Jose Garcia
Amrik Sen

Yuanting Chen
Dustin Keck
Sekson Sirisubtaweer

David Appelhans
Michael Brutz
Christopher Leibs
Henry Romero

Department of Applied Mathematics 2014 Annual Report

Faculty, Instructors, Research Associates, Visitors, and Staff

Core Faculty and Instructors

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

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

Stephen Becker – Assistant Professor; California Institute of Technology. *Optimization, Numerical Linear Algebra, Mathematical Applications, Physical Applications*

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.*

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

Murray Cox – Instructor; PhD, Texas A&M University.

Ryan Croke – Instructor; PhD, Colorado State University. *Nonlinear Phenomena*

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

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.*

Yolanda Hagar – Research Associate and Instructor; PhD, University of California Davis

Mark Hoefler – Assistant Professor; PhD, University of Colorado Boulder. *Fluid dynamics of dispersive media; Dynamics of ferromagnetic media, spin torque, and localized excitations in nanomagnetism*

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

Christian Ketelsen – Instructor; PhD, University of Colorado Boulder. *Computational Mathematics*

William Kleiber – Assistant Professor; PhD, University of Washington Seattle. *Multivariate Process Modeling, Stochastic Modeling of Physical Systems.*

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

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

Yiping Ma – Research Associate and Instructor; PhD, University of California Berkeley. *Nonlinear Phenomena, Physical Applied Mathematics.*

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 Emeritus; 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.*

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

Juan Restrepo – Assistant Professor; PhD, Northeastern University. *Analysis of dynamical processes on complex networks*

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

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

Post-Doctoral Research Associates

Douglas Baldwin – PhD, University of Colorado Boulder

Marian Brezina – PhD, University of Colorado at Denver..

Samuel Butler – PhD, University of Sydney

Michael Calkins - PhD, University of California Los Angeles.

Philippe Marti – PhD, Eidgenössische Technische Hochschule Zürich

Benjamin Miquel – PhD,

Lucas Monzon – PhD, Yale University.

John Ruge – PhD, Colorado State University.

Igor Rumanov – PhD,

Sergey Voronin – PhD, Princeton University

Affiliated Faculty

Steve C. Arendt – Colorado Research Associates

Meredith Betterton – Physics

Elizabeth Bradley – Computer Science

Richard Byrd – Computer Science

Xiao-Chuan Cai – Computer Science

John Cary – Physics

John Crimaldi - Computer Science

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)

Samuel Flaxman - Ecology and Evolutionary Biology

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

Shannon Hughes – Electrical, Computer, and Energy Engineering

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

Nathalie Moyen - Finance

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

Patrick Weidman – Mechanical Engineering

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

Joseph Werne – Colorado Research Associates

Department Staff

Mary Fentress – Director of Operations

Matthew Clifford/Catriona Allcock – Graduate Program Assistant.

Anna Gonzales - Accounting Technician

Ian Cunningham - Office Coordinator and Undergraduate Program Assistant

William Marquis/Jay Lecavalier - Part-Time IT Support

Meg Kwiat, Eva Lambeck – Part-Time Student Assistants

Changes in Personnel

Professor Steve McCormick retired at the end of 2013. He is currently enjoying an active retirement in the Boulder area.

Professor Stephen Becker was hired for the Fall 2014 semester. He comes to us from IBM Research in New York, and received his PhD from CalTech.

Professor Mark Hoefer also joined APPM for Fall 2014. Mark returns to Colorado after several years at North Carolina State University.

Matt Clifford left the department at the beginning of the Fall 2014 semester, and Catriona “Trina” Allcock joined as his replacement in November 2014.

Visitors in 2014

Nalini Joshi - January 20-21st

Lake Bookman - September 22 - October 9

Rod Halburd - February 17-19th

Shmeul Fishman - September 23-26th

Or Aldus - February 19-28th

Guust Nolet - December 10th

Sarah Gerster - March 4-21st

Ali Demirci - AY 2014-2015

Jeff Vasil - May 19-23rd

Keaton Burns - May 19-23rd

Christopher Curtis - July 7-11th

Department of Applied Mathematics 2014 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.

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|------------|--|---|
| 01/21/2014 | David Appelhans , Department of Applied Mathematics,
University of Colorado Boulder | <i>Range Decomposition with Adaptive Mesh Refinement for Peta and Exascale Computing</i> |
| 02/11/2014 | Christian Ketelsen , Department of Applied Mathematics,
University of Colorado Boulder | <i>Multilevel Markov Chain Monte Carlo for Uncertainty Quantification in Subsurface Flow</i> |
| 02/18/2014 | Brad Martin , Department of Applied Mathematics,
University of Colorado Boulder | <i>Seismic wave simulation through radial basis function-derived finite differences (RBF-FD): preliminary results from a new 3rd-order numerical method</i> |
| 02/25/2014 | John Ruge , Department of Applied Mathematics,
University of Colorado Boulder | <i>Algebraic Multigrid</i> |
| 03/04/2014 | Harihar Rajaram , Department of Civil, Environmental,
and Architectural Engineering; University of Colorado
Boulder | <i>Glacier and Ice Sheet Modeling - governing equations and numerical methods</i> |
| 03/11/2014 | Jeff Heys , Chemical and Biological Engineering,
Montana State University | <i>Echocardiographic Particle Image Velocimetry Data Assimilation with Least-Square Finite Element Methods</i> |
| 03/18/2014 | Chris Leibs , Department of Applied Mathematics,
University of Colorado Boulder | <i>Two-Fluid Plasma</i> |
| 04/15/2014 | Jörg Sautter , Department of Engineering, Aschaffenburg
University of Applied Sciences | <i>Toward CAE of Vertical Axis Wind Turbines</i> |
| 04/22/2014 | Ben Cowan , Research and Development Manager,
Tech-X Corporation | <i>Application of multigrid techniques to electromagnetic systems</i> |
| 04/29/2015 | Jay Stotsky , Department of Applied Mathematics,
University of Colorado Boulder | <i>Numerical Simulation of Bacterial Biofilms</i> |
| 09/09/2014 | Benjamin Sturdevant , Department of Applied
Mathematics, University of Colorado Boulder | <i>An introduction to delta-f Particle in Cell Plasma Simulation</i> |

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|------------|--|---|
| 09/16/2014 | Alireza Doostan , Department of Aerospace Engineering Sciences, University of Colorado Boulder | <i>Uncertainty Quantification Using Polynomial Chaos Expansions: A Compressive Sampling Approach</i> |
| 09/23/2014 | Alyson Fox , Department of Applied Mathematics, University of Colorado Boulder | <i>Multilevel Solvers for the Graph Laplacian of Scale-Free Networks</i> |
| 09/30/2014 | Delyan Kalchev , Department of Applied Mathematics, University of Colorado Boulder | <i>Adaptive Spectral Algebraic Multigrid for Finite Element Elliptic Equations with Stochastic Coefficients</i> |
| 10/07/2014 | Jeff Heys , Chemical and Biological Engineering, Montana State University | <i>Improving Data with Models or Improving Models with Data</i> |
| 10/14/2014 | Luke Olson , Department of Computer Sciences, University of Illinois at Urbana-Champaign | <i>Using a Root-Node Based Approach to Algebraic Multigrid</i> |
| 10/21/2014 | Ben O'Neill , Department of Applied Mathematics, University of Colorado Boulder | <i>Parallel in time Algorithms for PDEs</i> |
| 10/28/2014 | Billy Armstrong ; Civil, Environmental, and Architectural Engineering; University of Colorado Boulder | <i>Glacier Depth Inverse Problem</i> |
| 11/04/2014 | Jeff Allen , Department of Applied Mathematics, University of Colorado Boulder | <i>New FOSLS Formulation of Nonlinear Stokes Flow for Glaciers</i> |
| 12/02/2014 | Xun Yin , Department of Chemical and Biological Engineering, University of Colorado Boulder | <i>Single-Molecule Approach to Molecular Binding on Supported Lipid Bilayers</i> |

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 in the Spring Semester.

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| 01/21/2014 | Nalini Joshi , School of Mathematics and Statistics, University of Sydney | <i>Geometry and Asymptotics</i> |
| 02/05/2014 | Gino Biondini , Department of Mathematics, State University of New York (SUNY) Buffalo | <i>The modulational instability revisited</i> |
| 02/18/2014 | Rod Halburd , Department of Mathematics, University College London | <i>Singularity and Integrability</i> |
| 03/04/2014 | Anton Dzhmay , School of Mathematical Sciences, University of Northern Colorado | <i>Discrete Schlesinger Equations and Difference Painlevé Equations</i> |
| 03/18/2014 | Yiping Ma , Department of Applied Mathematics, University of Colorado Boulder | <i>Traveling edge waves in optical honeycomb lattices</i> |

04/08/2014	Silvana De Lillo , Department of Mathematics and Computer Science, Università degli Studi di Perugia	<i>Traveling Waves in Elastic Rods with Arbitrary Curvature and Torsion</i>
04/29/2014	Sean Shaheen ; Department of Electrical, Computer, and Energy Engineering; University of Colorado Boulder	<i>Modeling of Organic Photovoltaics: Charge Transport, Charge Transfer Kinetics, and Exciton Dynamics</i>
09/09/2014	Gennady El , Department of Mathematical Sciences, Loughborough University	<i>Integrable Dynamics of Soliton Gases</i>
09/23/2014	Igor Rumanov , Department of Applied Mathematics, University of Colorado Boulder	<i>Quantum Painlevé II (QP II) and classical Painlevé II (PII): beta ensembles for beta = 6</i>
09/30/2014	Lake Bookman , Department of Mathematics, North Carolina State University	<i>Perturbations of the Landau-Lifshitz equation</i>
10/07/2014	Willy Hereman , Applied Mathematics and Statistics, Colorado School of Mines	<i>Symbolic Computation of Conservation Laws of Nonlinear Partial Differential Equations</i>
10/14/2014	Olivier Pinaud , Department of Mathematics, Colorado State University	<i>Waves in random media: asymptotics and applications</i>
10/21/2014	Boaz Ilan ; School of Natural Sciences; University of California, Merced	<i>Spectral Mirror Imaging</i>
11/04/2014	Aurelian Coillet , National Institute of Standards and Technology (NIST)	<i>Modelling of Kerr frequency combs: successes and challenges</i>

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.

01/23/2014	Daniel Cristofaro-Gardiner , Department of Mathematics, Harvard University	<i>Symplectic techniques in Hamiltonian dynamics</i>
01/30/2014	Oleg V. Vasilyev , Department of Mechanical Engineering, University of Colorado Boulder	<i>Hierarchical Wavelet-based Modeling of Turbulent Flows</i>
02/06/2014	Samuel Flaxman , Department of Ecology and Evolutionary Biology, University of Colorado Boulder	<i>Genomic Architecture Drives the Rapid Origin of New Species</i>
02/13/2014	Mark Rast , Department of Astrophysical and Planetary Sciences and Laboratory for Atmospheric and Space Physics, University of Colorado Boulder	<i>The roll of intermittency in scalar transport by turbulent flows</i>
02/20/2014	Or Alus , Department of Physics, Technion - Israel Institute of Technology	<i>Out of the Self Similar Point - Progress Report: Statistical description of mixed phase space systems</i>



02/27/2014	Arkady Pikovsky , Department of Physics, University of Potsdam	<i>Chaotic destruction of Anderson localization in nonlinear lattices</i>
03/06/2014	John Lapeyre , The Institute of Photonic Sciences, Castelldefels, Spain	<i>Single particle tracking, charge transport, and ergodicity breaking</i>
03/13/2014	Tom Hraha , Department of Bioengineering, University of Colorado Anschutz Medical Campus	<i>Synchronization and Phase Transitions in the Pancreatic Islet with implications for Diabetes</i>
03/20/2014	Leto Peel , Department of Computer Sciences, University of Colorado Boulder	<i>Detecting change points in the large-scale structure of evolving networks</i>
04/03/2014	Brock Mosovsky , Ascend Analytistics, LLC	<i>Finite-Time Transport in Volume-Preserving Flows</i>
04/17/2014	Warren Lord , Department of Applied Mathematics, University of Colorado Boulder	<i>Singular value decomposition methods for understanding long term dynamics on networks</i>
05/01/2014	Tiago de Paul Peixoto , Institute for Theoretical Physics, University of Bremen	<i>Hierarchical Block Structures and High-Resolution Model Selection in Large Networks</i>
06/16/2014	Oleg Makarenkov , Department of Mathematical Sciences, University of Texas Dallas	<i>A new generic bifurcation from a fold-fold singularity of a discontinuous system</i>
08/21/2014	Lev Lerman , Lobachevsky University of Nizhni Novgorod	<i>An introduction to Shilnikov bifurcations</i>
08/28/2014	Robert Easton , Department of Applied Mathematics, University of Colorado Boulder	<i>Shaking the Dice Model - Economics and Climate Change</i>
09/04/2014	Hideyuki Hotta , High Altitude Observatory, National Center for Atmospheric Research (NCAR)	<i>Significant feedback from small-scale magnetic field and efficient energy transport in the solar convection zone</i>
09/11/2014	Juan Restrepo , Department of Applied Mathematics, University of Colorado Boulder	<i>Mean field theory of assortative networks of phase oscillators</i>
09/25/2014	Hannah Christensen , Department of Physics, University of Oxford	<i>Stochastic Parametrisation and Model Uncertainty in the Lorenz '96 System.</i>
10/09/2014	Behrooz Touri ; Department of Electrical, Computer, and Energy Engineering; University of Colorado Boulder	<i>Convergence properties of random stochastic matrices</i>
10/16/2014	Hiroshi Ashikaga , Division of Cardiology, Johns Hopkins University School of Medicine	<i>Information Theory of the Heart</i>
10/23/2014	Yue-Kin Tsang , School of Mathematics, University of Edinburgh	<i>Advection-condensation of water vapor in a model of coherent stirring</i>



10/30/2014	Hanspeter Schaub , Department of Aerospace Engineering Sciences, University of Colorado Boulder	<i>GEO Space Debris Dynamics</i>
11/13/2014	Inom Mirzaev , Department of Applied Mathematics, University of Colorado Boulder	<i>Laplacian dynamics with synthesis and degradation</i>
11/20/2014	Yogesh Virkar , Department of Computer Science University of Colorado Boulder	<i>Effects of network structure on the synchronization of Hamiltonian systems</i>
12/04/2014	Lev A. Ostrovsky , Earth Systems Research Laboratory, National Oceanic and Atmospheric Association (NOAA)	<i>Self-synchronization in an ensemble of nonlinear oscillators</i>

Fridays - Applied Mathematics Colloquium

The Applied Mathematics Colloquium series was held on select Friday afternoons during the academic year at 3:00 pm, with refreshments preceding at 2:30 pm in the Applied Mathematics Newton Lab. Jem Corcoran chaired and organized the Colloquium Series in Spring 2014, with Will Kleiber taking the reins in the Fall.

01/24/2014	Lynn Schreyer-Bennethum , Department of Mathematical and Statistical Sciences, University of Colorado Denver	<i>Introduction to Modeling of Porous Media via Hybrid Mixture Theory and Results on Flow Potentials</i>
01/31/2014	Christian Ketelsen , Department of Applied Mathematics, University of Colorado Boulder	<i>Multilevel Markov Chain Monte Carlo for Uncertainty Quantification in Subsurface Flow</i>
02/14/2014	Ram Nair , Institute for Mathematics Applied to Geosciences, University Corporation for Atmospheric Research (UCAR)	<i>Discontinuous Galerkin Models for Atmospheric Numerical Modeling</i>
02/21/2014	Matthias Katzfuß , Department of Statistics, Texas A&M University	<i>Parallel inference for massive distributed spatial using low-rank models</i>
02/28/2014	Pavol Cerny , Department of Electrical, Computer, and Energy Engineering; University of Colorado Boulder	<i>Program Synthesis for Network Updates</i>
04/04/2014	Seth Sullivant , Department of Mathematics, North Carolina State University	<i>Phylogenetic Algebraic Geometry</i>
04/11/2014	Nathan Kutz , Department of Applied Mathematics, University of Washington	<i>Sparsity and Equation-Free Methods for Complex Systems</i>
04/18/2014	Clay Thompson , Senior Scientist, Pfizer Pharmaceuticals	<i>Quantitative Systems Modeling in the Pharmaceutical Industry</i>
04/25/2014	Scot Elkington , Laboratory for Atmospheric and Space Physics (LASP), University of Colorado Boulder	<i>Resonant wave-particle interactions and the dynamics of Earth's space radiation environment</i>

08/25/2014	Lev Lerman , Lobachevsky University of Nizhni Novgorod	<i>Mathematics in a Big Closed Russian City during the Cold War: Gorky-Nizhny Nogorod Mathematical Community</i>
09/12/2014	Darren Homrighausen , Department of Statistics, Colorado State University	<i>Supernova classification using photometric measurements</i>
09/26/2014	Don Estep , Department of Statistics, Colorado State University	<i>Solving stochastic inverse problems using sigma-algebras on contour maps</i>
10/03/2014	Jed Brown , Department of Computer Science, University of Colorado Boulder	<i>On reducing communication and improving adaptivity in nonlinear multigrid methods</i>
10/10/2014	Wenxiong Chen , Department of Mathematics, Yeshiva University	<i>Liouville Theorems for α-harmonic functions in R^n and in a half space</i>
10/24/2014	James O. Ramsay , Department of Psychology, McGill University	<i>Multivariate and Functional Principal Components without Eigenanalysis</i>
11/07/2014	Amanda S. Hering , Department of Applied Mathematics and Statistics, Colorado School of Mines	<i>Robust Multivariate Error Detection in Skewed Data with Application to Historical Radiosonde Winds</i>
12/05/2014	Michael Scheurer , National Oceanic and Atmospheric Administration (NOAA) and Cooperative Institute for Research in Environmental Sciences (CIRES)	<i>Evaluating the performance of probabilistic forecasts of univariate and multivariate quantities</i>

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.

Statistics Seminar

02/24/2014	Steve Scott , Google Research	<i>Bayes and Big Data: The Consensus Monte Carlo Algorithm</i>
03/19/2014	Eugenia Skirta , Department of Mathematics, East Stroudsburg University	<i>Statistical Education and Consulting Center and its Role in Enhancing the Quality of Undergraduate Student Research in Sciences</i>

Applied Mathematics Assistant Professor Search

11/11/2014	Ian Grooms , Courant Institute of Mathematical Sciences, New York University	<i>Stochastic superparameterization and multiscale multiscale ensemble Kalman filters for geophysical turbulence</i>
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11/13/2014 **Kevin Flores**, Department of Mathematics,
North Carolina State University

*Mathematical modeling in personalized medicine
and environmental toxicology*

11/14/2014 **Tom Trogdon**, Courant Institute of Mathematical Sciences,
New York University

*Riemann--Hilbert Problems, Computation and
Universality*

11/18/2014 **Michael Calkins**, Department of Applied Mathematics,
University of Colorado Boulder

*Multi-scale Models for Geophysical and
Astrophysical Flows*

11/20/2014 **Zachary Kilpatrick**, Department of Mathematics,
University of Houston

*Stochastic dynamics of nonlinear waves in
neuronal networks*

2014 Front Range Applied Mathematics Student Conference Keynote Speaker

03/01/2014 **Stephan Sain**, Institute for Mathematics Applied to
Geosciences, National Center for Atmospheric Research

*Solving the Earth's Equations: Mathematics and
Statistics at the National Center for Atmospheric
Research*

Boulder Dynamics Conference in Honor of Jim Meiss' 60th Birthday

On July 21st, the Department of Applied Mathematics held a conference in celebration of APPM professor Jim Meiss' 60th birthday. Participating were Or Alus, Arnd Baecker, Lora Billings, Erik Bollt, Liz Bradley, Henk Broer, Carlo Cafaro, John Cary, Itzhack Dana, Diego del Castillo Negrete, Charles Jaffe, Keith Julien, Roland Ketzerik, Eric Kostelich, Steffen Lange, Lev Lerman, Manuel Lladser, John Lowenstein, Robert McLachlan, Narcis Miguel, Bruce Miller, J.D. Mireles-James, Kevin Mitchell, Brock Mosovsky, Norman Murray, Ed Ott, Bruce Peckham, Rafael Ramierz-Ros, Juan Restrepo, Vanessa Robins, Anderson Rodney, Vered Rom-Kedar, Jake Ross, Turgay Uzer, Arturo Vieiro, Franco Vivaldi, Holger Waalkens, and Patrick Weidman.





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Student Organizations

Society for Industrial and Applied Mathematics (SIAM)

The University of Colorado at Boulder undergraduate chapter of the Society for Industrial and Applied Mathematics (SIAM) was founded to promote interactions between Applied Mathematics students and faculty. Society functions include technical presentations by students, faculty, and industry speakers, field trips and student/faculty social events –all designed to introduce undergraduates to the widespread use of applied mathematics in engineering and the sciences. All interested students, from any major, are encouraged to participate in SIAM-sponsored events. Sujeet Bhat served as the faculty advisor for the Undergraduate Chapter in 2014.

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. Typical meetings involve a member of the organization giving a short, informal talk about their research. Tom Manteuffel served as the Faculty Advisor for the Graduate Chapter in 2014. Tony Wong served as chapter president, and Meredith Plumley as chapter vice-president.

10th Annual Front Range Applied Mathematics Student Conference

Saturday, March 1st, 2014

Location: The University of Colorado at Denver

This conference allowed student representatives, both undergraduate and graduate, from universities across the Front Range to meet and share research in the field of applied mathematics. Participating universities in 2014 were Colorado College, the Colorado School of Mines, Colorado State University, the University of Colorado Boulder, the University of Colorado Denver, and the University of Wyoming.

Participants from the CU Boulder Department of Applied Mathematics were David Nieves, Tony E. Wong, Inom Mirzaev, Stephen Kissler, Victoria Gershuny, Ruth A. Martin, Nathan D. Monnig, Bradley Martin, Yan Chen, Rees McNally, and Warren M. Lord. Yogesh Virkar of the Department of Computer Science at CU Boulder also participated.

2014's Keynote Speaker was Stephan Sain of the National Center for Atmospheric Research.

2014 End-of-Year Dodgeball Classic

Friday, May 2nd, 2014

Location: Carlson Gymnasium, University of Colorado Boulder

This event, held at the end of the academic term, is billed as a way for students and faculty to relax and have fun before the stresses of final exams. This was the second year the event has been held by the SIAM students.

2014 Graduate Chapter Meetings

February 20, 2014	Brad Martin	<i>Accurate seismic wave simulation through radial-basis function-derived finite differences (RBF-FD)</i>
March 20, 2014	Henry Romero	<i>Cooperative Communications in the Multi-Access Setting</i>
April 17, 2014	Ruth Martin	<i>General Solutions to the Three-Wave Resonant Interaction Equations</i>
October 23, 2014	Dale Jennings	<i>MCMC Methods for Learning Structures of Bayesian Networks from Data</i>
November 6th, 2014	Alyson Fox and John Nardini	<i>Aly and John gave short presentations on Graphs and Math Bio, respectively.</i>
December 9th, 2014	Brock Mosovsky, Senior Energy Analyst, Ascend Analytics Mason “Andy” Kass, Research Geophysicist, United States Geological Survey	<i>Brock and Andy are APPM alumni asked to come in and talk about their research and work in the real world.</i>



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Faculty Research

Undergraduate Focused Grants

EXTREEMS - QED: Directions in Data Discovery (Data Cubed) in Undergraduate Education. Awarded August 1, 2014 through July 31, 2017. Anne Dougherty (Applied Math) serves as the PI, with Ken Anderson (CS), Per-Gunnar Martinsson (Applied Math), Francois Meyer (Electrical Engineering), and Doug Nychka (NCAR) as Co-PIs. The purpose of the grant is to enhance undergraduate education in data-enabled science. This is accomplished through (1) the creation of a statistics minor (approved Dec 2014) and creation of data science tracks in Applied Math and CS, (2) creation and revision of several courses which focus on large data, and (3) research projects for undergraduates which involve large data.

Individual Research Grants

Several new grants were received by APPM faculty in 2014, totaling nearly \$[...] in total funds received. Department faculty were Principal Investigator, or Co-Principal Investigator, on over [...] dollars in grant funding in 2014. APPM faculty remain strong researchers and work closely with both government and private industry.

Mark J. Ablowitz

Principal Investigator on Grants Received

National Science Foundation-Division of Mathematical Sciences (NSF-DMS), “Nonlinear wave motion”, 2009-2016

Co-Principal Investigator on Grants Received

NSF-Division of Chemistry (NSF-CHE), “SOLAR Collaborative: Photonic Enhancement of Organic Photovoltaics to Enable Higher Efficiencies and Exotic Mechanisms”, 2011-2014

Gregory Beylkin

Co-Principal Investigator on Grants Received:

NSF-DMS, “Reduction Approach to Stochastic PDEs: Forward Uncertainty Propagation and Stochastic Homogenization”, 2012-2015



David M. Bortz

Principal Investigator on Grants Received

NSF-DMS, “Microbial Flocculation Dynamics”, 2012-2015

Co-Principal Investigator on Grants Received

NSF-PHY, “Collaborative Research: Type II: Flow-induced fragmentation mechanisms in bacterial biofilms by hierarchical modeling of polymeric, interfacial and viscoelastic interactions”, 2009-2014

National Institute of General Medical Sciences (NIH-NIGMS), “Complement C5a in Human Sepsis”, 2011-2015

NSF Cyber-Physical Systems, “In-Silico Functional Verification of Artificial Pancreas Control Algorithms”, 2014-2017

Murray Cox

Co-Principal Investigator on Grants Received:

Presidents Teaching and Learning Collaborative (PTLC), Research on teaching and learning methods in Calculus I and II, 2014

Anne Dougherty

Principal Investigator on Grants Received:

NSF EXTREEMS-QED, “Directions in Data Discovery (Data Cubed) in Undergraduate Education”, 2014-2017

Co-Principal Investigator on Grants Received:

NSF-GEO, “CNH: Cooking up clean air: Scaled-up quality and health impacts of clean cook stoves in Ghana”, 2012-2015

Environment Protection Agency (EPA), “Scaled-up models for air quality and health impact of cook stoves” 2014-2017

Vanja Dukic

Principal Investigator on Grants Received:

NIH, “Modeling the spread of MRSA in the Community”, 2010-2014

NSF-DEB, “Collaborative Research: Scaling up epizootic dynamics: Linking individual infection to spatial spread of a disease using Bayesian hierarchical approaches” 2013-2016

Bengt Fornberg

Principal Investigator on Grants Received:

Shell International Exploration and Production, Inc., “Radial Basis Functions (RBF) for wave propagation changing the media”, 2012-2014

Mark Hoefler

Principal Investigator on Grants Received

NSF-DMS, “Solitary Waves and Wavetrains in Dispersive Media” 2014-

Keith Julien

Principal Investigator on Grants Received

NSF-Cooperative Studies of the Earth’s Deep Interior (CSEDI), “Collaborative Research: Next Generation Modeling of Core Turbulence via Combined Laboratory, Numerical, and Theoretical Model”, 2011-2015

NSF-Computational and Data-Enabled Science and Engineering (CDS&E), “Collaborative Research: Formation, properties and evolution of protoplanetary vortices: Multiscale investigations of baroclinic instability”, 2013-2016

NSF-Earth Sciences (EAR), “Next Generation Modeling of the Geodynamo: Development of the First Multi-Scale Dynamo Model”, 2013-2016

William Kleiber

Principal Investigator on Grants Received

NSF-DMS, “Collaborative Research: Theory and Methods for Massive Non-stationary and Multivariate Processes” 2014-2017

NSF-DMS, “Collaborative Research: Scalable Statistical Validation and Uncertainty Quantification for Large Spatio-Temporal Datasets” 2014-2017

Congming Li

Principal Investigator on Grants Received:

NSF-DMS, “Qualitative analysis focused on some nonlinear systems” 2014-2017

Manuel B. Lladser

Co-Principal Investigator on Grants Received

Royal Society of London International Exchanges Scheme, “Dispersive Regularization of Non-Convex Hyperbolic Conservation Laws”

Co-Principal Investigator on Grants Received

National Aeronautics and Space Administration (NASA), “Langmuir Circulations; Observing and Modeling on Global Scales”, 2009-2012

NSF- Collaboration in Mathematical Geosciences (CMG), “Collaborative Research: Multiscale Modeling between Langmuir Turbulence and Submesoscale Variability in the Oceanic Mixed Layer”, 2009-2013

NSF-Expeditions in Training, Research, and Education for Mathematics and Statistics through Quantitative Explorations of Data (NSF EXTREMES-QED), “Directions in Data Discovery (Data Cubed) in Undergraduate Education”



Thomas A. Manteuffel

Principal Investigator on Grants Received:

Department of Energy (DOE), “First-order system least-squares (FOSLS) for nonlinear systems arising from DOE applications”, 2010-2014

NSF, “Collaborative Research: Least-Squares Finite Element Methods for Data Assimilation in Large-Scale Simulations”, 2013-2016

DOE, “Center for Exascale Radiation Transport”, 2013-2018

Per-Gunnar Martinsson

Principal Investigator on Grants Received:

Defense Advanced Research Projects Agency (DARPA), “Randomized methods for linear algebra and data analysis”, 2013-2015

NSF-DMS, “Scalable and accurate direct solvers for integral equations on surfaces”, 2013-2016

Co-Principal Investigator on Grants Received:

NSF EXTREEMS-QED, “Directions in Data Discovery (Data Cubed) in Undergraduate Education”, 2014-2017

James Meiss

Principal Investigator on Grants Received:

NSF-DMS, “Structure, Transport, and Chaos in Volume-Preserving Dynamics”, 2012-2017

Co-Principal Investigator on Grants Received:

EAGER, “Computational Topology Techniques for Characterizing Multi-Regime Time Series Data”, 2014-2015

Harvey Segur

Principal Investigator on Grants Received:

NSF-DMS, “Collaborative Research: Nonlinear Water Waves”, 2011-2014



Publications

Research dollars alone do not measure the quality of an academic body's faculty - the dictum of "Publish or Perish" still holds. We cite the peer reviewed materials published below.

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Stephen Becker

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David M. Bortz

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Murray Cox

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Ryan Croke

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Z. Cheng, C. Li, “Shooting method with sign-changing nonlinearity”, *Nonlinear Analysis: Theory, Methods & Applications*, vol. 114, pp. 2-12

Manuel B. Lladser

J. Azofeifa, MA Allen, MB Lladser, R. Dowell, “FStitch: a fast and simple algorithm for detecting nascent RNA transcripts”, *Proceedings of the 5th ACM Conference on Bioinformatics, Computational Biology, and Health Informatics (BCB '14)*, pp. 174-183 ACM, New York, NY, USA

Thomas A. Manteuffel

M. Brezina, A. Doostan, T. Manteuffel, S. McCormick, J. Ruge, “Smoothed aggregation algebraic multigrid for stochastic PDE problems with layered materials”, *Numerical Linear Algebra With Applications* vol. 21, issue 2, pp. 239-255

P. K. Rajaraman, T. A. Manteuffel, M. Belohlavek, E. McMahon, J. J. Heys, “Echocardiographic particle imaging velocimetry data assimilation with least square finite element methods”, *Computers & Mathematics with Applications*, Vol. 7

J. Chaudhry, E. Cyr, L. Kuo, T. Manteuffel, L. Olson, L. Tang, “A Goal-Oriented Approach to Least-Squares Finite Element Methods” *SIAM J. Numer. Anal.*, Vol. 52, No. 6

Per-Gunnar Martinsson

S. Hao, A.H. Barnett, P.G. Martinsson, and P. Young, “High-order accurate Nystrom discretization of integral equations with weakly singular kernels on smooth curves in the plane.” *Advances in Computational Mathematics*, 40(1), pp. 245-272

A. Gillman, P.G. Martinsson “A fast solver for Poisson problems on infinite regular lattices” *Journal of Computational and Applied Mathematics*, 258(1), pp. 42-56

A. Gillman, S. Hao, P.G. Martinsson “A simplified technique for the efficient and high-order accurate discretization of boundary integral equations in 2D on domains with corners” *Journal of Computational Physics*, 256(1), pp. 214--219

A. Gillman, P.G. Martinsson “A direct solver with $O(N)$ complexity for variable coefficient elliptic PDEs discretized via a high-order composite spectral collocation method” *SIAM Journal on Scientific Computation*, 36(4), pp. A2023-A2046

A. Gillman, P.G. Martinsson “An $O(N)$ algorithm for constructing the solution operator to 2D elliptic boundary value problems in the absence of body loads” *Advances in Computational Mathematics*, 40(4), pp 773 - 796

James D. Meiss

JG Restrepo, JD Meiss, “Onset of synchronization in the disordered Hamiltonian mean-field model”, *Physical Review E* vol. 89, issue 5, Article Number ARTN 052125

RM Neupauer, JD Meiss, DC Mays, “Chaotic advection and reaction during engineered injection and extraction in heterogeneous porous media”, *Water Resources Research*, vol. 50, issue 2, pp. 1433-1447

A.M. Fox, J.D. Meiss, “Critical Invariant Circles in Asymmetric and Multiharmonic Generalized Standard Maps,” *Comm. Nonl. Sci. and Num. Simul.* vol. 19, issue 4, pp. 1004–1026

O. Alus, S. Fishman, and J.D. Meiss, “Statistics of the Island-Around-Island Hierarchy in Hamiltonian Phase Space”, *Phys. Rev. E* vol. 90, issue 6, ARTN 062923

Juan G. Restrepo

JG Restrepo, JD Meiss, “Onset of synchronization in the disordered Hamiltonian mean-field model”, *Physical Review E* vol. 89, issue 5, Article Number ARTN 052125

PS Skardal, A. Karma, JG Restrepo, “Spatiotemporal dynamics of calcium-driven cardiac alternans”, *Physical Review E* vol. 89, issue 5, ARTN 052707

DB Larremore, WL Shew, E. Ott, F. Sorrentino, JG Restrepo, “Inhibition Causes Ceaseless Dynamics in Networks of Excitable Nodes”, *Physical Review Letters* vol. 112, issue 13, ARTN 138103

JG Restrepo, E. Ott, “Mean field theory of assortative networks of phase oscillators”, *Europhys. Lett.* 107, 60006

PS Skardal, JG Restrepo, “Coexisting chaotic and multi-periodic dynamics in a model of cardiac alternans”, *Chaos* 24, 043126

P Madhusudhanan, JG Restrepo, Y. Liu, TX Brown, K. Baker, “Generalized Carrier to Interference Ratio Analysis for the Shotgun Cellular System”, *IEEE Transactions on Wireless Communications* 13, 6684

PS Skardal, D. Taylor, JG Restrepo, “Complex macroscopic behavior in systems of phase oscillators with adaptive coupling”, *Physica D* 267, pp. 27-35

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.

Mark Ablowitz

Electrical Engineering Dept.
Colloquium, North Carolina State Univ, Jan. 17, 2014, “Nonlinear waves from beaches to photonic lattices”

Applied Mathematics Dept.,
Colloquium, Calif. Inst. of Tech.,
Feb 3, 2014, “Nonlinear waves from beaches to photonic lattices”

Center for Nonlinear Studies, Los Alamos National Laboratory,
Colloquium, March 10, 2014,
“Nonlinear waves from beaches to photonic lattices”

Frontiers in Applied Mathematics,
New Jersey Institute of Technology,
May 22-23, 2014, May 22, 2014
“Nonlinear waves, solitons and applications”

Nonlinear Waves in Sicily, June 8-13, 2014, June 9, 2014 “Nonlinear wave in photonic lattices”

SIAM Conference NL Waves and Coherent Structures, Cambridge University, UK, Aug. 11-14, 2014, Aug. 11, 2014, “Nonlinear waves from beaches to photonics”

Nonlinear Optics Workshop, Air Force BRIC, Arlington, VA. Oct. 2, 2014, “Photonic honeycomb lattices: localized linear and nonlinear edge states”

Colloquium, University of Ioannina, Greece, Oct. 23, 2014, “Nonlinear waves—Always Alluring”

Colorado Nonlinear days, University of Colorado, Colorado Springs, Nov. 1, 2014, “Nonlinear Waves- Still Many Surprises”

David Bortz

Michigan State Science at the Edge Seminar Series, February 7, 2014, East Lansing, MI

SIAM Conference on the Life Sciences, Aug. 4, 2014, Charlotte, NC

Colorado School of Mines Mathematics & Statistics Colloquium, Sept. 19, 2014, Golden, CO

Jem Corcoran

Statistics Seminar, Spring 2014, Colorado State University

Math Club, Fall 2014, CU Boulder

Murray Cox

6th Annual symposium on STEM education, Sept 29, 2014, poster presentation

Andrews Symposium, November 4, 2014

Anne Dougherty

6th Annual symposium on STEM education, Sept 29, 2014, poster presentation, “Placement and Assessment are Key!”

Vanja Dukic

Workshop on Statistics and Nonlinear Dynamics in Biology and Medicine, Banff Research Station, Banff, Alberta, Canada

Bengt Fornberg

NCAR Colloquium, Boulder, CO

ISCOSAHOM Conference, Salt Lake City, UT

SIAM Annual Meeting, Chicago, IL

Society of Exploration Geophysicists annual meeting, Denver, CO

Mark Hoefler

Mathematical Methods Seminar,
Applied Mathematics Department,
University of Washington, January
2014, “Dispersive Hydrodynamics
of Viscous Fluid Conduits”, Seattle,
WA

Nonlinear Guided Waves VII, May 2014,
“Dissipationless/Dispersive
Interfacial Waves Guided by Viscous
Fluid Conduits”, Kingussie,
Scotland

Applied Mathematics Seminar,
Department of Mathematical
Sciences, Loughborough University,
May 2014, “Viscous Liquid
Conduits, an Ideal Dispersive
Hydrodynamic Medium”,
Loughborough, UK

SIAM Conference on Nonlinear
Waves and Coherent Structures,
August 2014, “Large Amplitude
Solitary Waves and Dispersive
Shock Waves in Conduits of Viscous
Liquids”, Cambridge, UK

Boulder Fluids Seminar, Department
of Mechanical Engineering,
University of Colorado Boulder, August
2014, “Large Amplitude Solitary
Waves and Dispersive Shock Waves
in Conduits of Viscous Liquids”,
Boulder, CO

Applied Mathematics Seminar,
Colorado State University, October
2014, “Experiments on Solitons,
Dispersive Shock Waves, and Their
Interactions”, Ft. Collins, CO

Colorado Nonlinear Days, November
2014, “Observation of Two-Soliton
Lax Categories in Conduits
of Viscous Liquids”,
Colorado Springs, CO

Seminar, Institute of Research in
Applied Mathematics and Systems
(IIMAS), National University of
Mexico (UNAM), November 2014,
“Experiments on Solitons,
Dispersive Shock Waves, and Their
Interactions”, Mexico City, Mexico

Colloquium, Department of
Mathematics, University of
Colorado Colorado Springs,
December 2014, “Experiments on
Solitons, Dispersive Shock Waves,
and Their Interactions”, Colorado
Springs, CO

Keith Julien

Institute for Pure and Applied
Mathematics Tutorial Week Lecture,
Sept. 10. 2014,
“Geophysical and Astrophysical
Turbulence I”, University of
California at Los Angeles

UCLA Earth and Planetary Sciences
Seminar, Oct 16th. 2014, “Attacking
Low Rossby Number Convective Flows
via Asymptotics and Simulation”,
University of California at Los Angeles

Institute for Pure and Applied
Mathematics Long Program on the
Mathematics of Turbulence, Workshop
III: Geophysical and Astrophysical
Turbulence, Oct. 31. 2014, “Geostrophic
turbulence and the formation of large
scale structure by Knobloch & Julien”,
University of California at Los Angeles

Institute for Pure and Applied
Mathematics Long Program on the
Mathematics of Turbulence,
Workshop III: Geophysical and
Astrophysical Turbulence,
Oct. 31. 2014, “Approaching the
Asymptotic Regime of Rapidly
Rotating Convection: Boundary
Layers vs Interior Dynamics”,
University of California at Los
Angeles

Institute for Pure and Applied
Mathematics Long Program on the
Mathematics of Turbulence,
Workshop III: Geophysical and
Astrophysical Turbulence,
Oct. 31. 2014, “Rotating compressible
convection and the breakdown of the
anelastic approximation. by Calkins,
Julien & Marti”,
University of California at Los Angeles

Mechanical Engineering Fluids
Seminar, Nov. 17. 2014 ,
“Approaching the Asymptotic
Regime of Rapidly Rotating
Convection via Asymptotics,
Simulations and Experiments”,
University of California at San
Diego

Boulder Fluids Seminar,
University of Colorado Boulder,
Dec. 2nd 2014, “Approaching the
Asymptotic Regime of Rapidly
Rotating Convection via
Asymptotics, Simulations
and Experiments”, Boulder, CO

Christian Ketelsen

Department of Applied Mathematics
Colloquium, Jan 2014, “Multilevel
Markov Chain Monte Carlo
Methods for Uncertainty
Quantification in Subsurface Flow”,
University of Colorado Boulder,
Boulder, CO

Thirteenth Copper Mountain
Conference on Iterative Methods,
March 2014, “A Least-Squares
Finite-Element Discretization of
the Neutron Transport Equation in
Spherical Geometry”, Frisco, CO

William Kleiber

“Equivalent Kriging”, Karlsruhe Institute for Technology, Germany.

Spatial Statistics Symposium, “The connection between smoothing splines and kriging”, Heidelberg Institute for Theoretical Studies, Germany.

Workshop on Stochastic Weather Generators, “High Resolution Simulation of Nonstationary Random Fields”, Avignon, France.

Joint Statistical Meetings, “High Resolution Simulation of Nonstationary Random Fields”, Boston, MA.

Joint Statistical Meetings, “Equivalent Kriging”, Boston, MA

Workshop on Spatial Statistics for Environmental and Energy Challenges, “Equivalent Kriging”, King Abdullah University of Science and Technology, Saudi Arabia.

Congming Li

Colloquium, January 2014, JiangSu Normal University, Xuzhou, China

Analysis/PDE seminar, February 2014, Johns Hopkins University.

Colloquium, April 2014, University of Science and Technology of China, HeFei, Anhui, China

Colloquium, April 2014, PDE center, East China Normal University, Shanghai, China

International Conference on Nonlinear Evolutionary Partial Differential Equations, June 3-8 2014, Shanghai Jiao Tong University, China

PDE Seminar, June 2014, Academy of Mathematics and Systems Sciences, Chinese Academy of Sciences, Beijing, China

10th AIMS Conference on Dynamical Systems, Differential Equations and Applications, July 7-11, 2014, Session organizer and speaker, Madrid, Spain

Second SJTU Summer School on Nonlinear Partial Differential Equations, July 13-25, 2014, Organizer and lecturer, Shanghai Jiao Tong University, China

Workshop on the analysis of Partial differential Equations III, July 19-25, 2014, Organizer and Speaker, Shanghai, China.

Manuel Lladser

Smith Lab Group Presentation, May 2014, Department of Molecular and Computational Biology, University of Southern California, Los Angeles, CA

Frontier Probability Days 2014, May 2014, University of Arizona

International Workshop on Applied Probability, June 2014, Antalya, Turkey

James Meiss 60th Birthday Conference, July 2014, University of Colorado Boulder

Per-Gunnar Martinsson

Mathematics Colloquium, Feb 2014, Colorado School of Mines, Golden, CO

Applied Mathematics and Computational Science Colloquium, Feb 2014, University of Pennsylvania, Philadelphia, PA

Program in Applied and Computational Mathematics Colloquium, Feb 2014, Princeton University, Princeton, NJ

Mathematics colloquium, March 2014, Rensselaer Polytechnic Institute, Troy, NY

CBMS: Fast Direct Solvers for Elliptic PDEs, June 23-27 2014, Principal Lecturer (10 talks), Dartmouth College, Hanover, NH

SIAM Annual Meeting Minisymposium, July 2014, “Practical and efficient direct solvers for BIEs”, Chicago, IL

SIAM Annual Meeting Minisymposium, July 2014, “Randomized methods for accelerating structured matrix computations”, Chicago, IL

International Conference on Applied Mathematics, Dec 2014, “Direct Solvers for Elliptic PDEs”, City University of Hong Kong.

Juan Restrepo

Networks Seminar, February 2014,
University of Houston

Mathematics Seminar, April 2014,
University of Minnesota

Applied Dynamics Seminar, October
2014, University of Maryland

Dynamics and Complex Systems
Seminar, September 2014,
University of Colorado Boulder

10th AIMS Conference on Dynamical
Systems, Differential Equations,
and Applications, July 2014,
“Stabilization of Incoherence in the
Disordered Hamiltonian Mean Field
Model”, Madrid, Spain

Boulder Dynamics conference in
honor of Jim Meiss, July 2014,
“Hamiltonian Synchronization”,
Boulder, CO

Harvey Segur

Fields Institute Conference on
Hamiltonian PDEs: Analysis,
Computation & Applications,
Jan 10, 2014,
“3-wave resonant interactions”,
Toronto, Ontario, Canada

Department of Mathematics
Kempner Colloquium, Feb 10, 2014,
“3-wave resonant interactions”
University of Colorado Boulder

Frontiers in Applied & Computational
Mathematics, May 22, 2014,
“The nonlinear Schrödinger
equation, dissipation and ocean
swell”, New Jersey Institute
of Technology, Newark, NJ

Workshop on Theory of Water
Waves, “Tsunami”, July 14, 2014,
Isaac Newton Institute, Cambridge, U.K.

Department of Mathematics Collo-
quium, Feb 7, 2014, “The nonlinear
Schrödinger equation, dissipation
and ocean swell”, University of
Wisconsin, Madison, WI

Department of Applied Mathematics 2011 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

Chair of the Department

Chairs and Directors Advisory Council (CDAC)

Editorial Board: Cambridge Texts in Applied Mathematics, Studies in Applied Mathematics, Dynamics of Partial Differential Equations

Sujeet Bhat

APPM Undergraduate Committee

APPM representative: Prospective Students Day recruiting event

Faculty Advisor: Undergraduate Chapter of SIAM student group, ASPIRE Summer Freshman Math Program

Ryan Croke

University Faculty Student Mentorship Program

Stephen Becker

APPM Undergraduate Committee

University Faculty Student Mentorship Program

David M. Bortz

APPM Professional Masters Degree Committee, Chair

APPM Assistant Professor Hiring Committee, Academic Prioritization Committee, School of Mathematical Sciences Committee

Consultant: Hughes Research Lab

Editorial Board: Mathematical Biosciences and Engineering, SIAM Undergraduate Research Online

James H. Curry

University Search Committee: Dean of College of Communication, Media, and Information

Session Chair/Moderator: Ford Foundation 2014 Annual Program

SIAM Membership Committee

Presidential Teaching Scholar's Selection Committee

Program Director: NSF Division of Mathematical Sciences

Gregory Beylkin

APPM Executive Committee

Editorial Board: Applied and Computational Harmonic Analysis

Jem Corcoran

APPM 25th Anniversary Committee

APPM Probability and Statistics Preliminary Exam Committee

University PUEC committees: Sujeet Bhat, Murray Cox, Ryan Croke, Christian Ketelsen, Anne Dougherty; Chair for all

Editorial Board: Involve

Anne M. Dougherty

Associate Chair of the Department

APPM Undergraduate Committee, Chair

APPM representative: Admitted Students Day, Engineering Orientation, Engineering Undergraduate Education Council, Engineering Scholarship Committee

University PUEC committees: Sujeet Bhat, Murray Cox, Ryan Croke, Christian Ketelsen

Actuarial Studies and Quantitative Finance Committee

Organizer: Front Range Applied Mathematics Student Conference

Vanja Dukic

APPM Graduate Admissions Committee, Probability and Statistics Preliminary Exam Committee, School of Mathematics Committee

Arts & Sciences Council, A&S Executive Committee

Arts & Sciences Budget Committee, Chair

Boulder Campus Cyberinfrastructure Board

Editorial Board: STAT

International Society for Bayesian Analysis: Lindley Prize Committee, Program Council, Organizer 2014 World Meeting

Keith Julien

APPM Executive Committee

APPM School of Mathematics Committee, Faculty Search Committee; Chair for both

University PUEC Committee, Chair: Vanja Dukic

University PUEC Committee: Per-Gunnar Martinsson

Arts & Sciences Tenure and Promotions Committee

Editorial Board: Nonlinearity

Institute for Pure and Applied Mathematics: Long Program committee

Manuel Lladser

APPM Undergraduate Committee, Faculty Search Committee

APPM Probability and Statistics Preliminary Exam Committee, Chair

University PUEC committee: Jem Corcoran

IQ Biology Advising Committee

2015 Meeting on Analytic Algorithmics and Combinatorics, Program Committee

Bengt Fornberg

APPM Executive Committee, Faculty Evaluation Committee, Numerics Preliminary Exam Committee

University PUEC Committee, Chair: Per-Gunnar Martinsson

Boulder Faculty Assembly: Administrative Services and Technology Committee

Will Kleiber

APPM Probability and Statistics Preliminary Exam Committee, Undergraduate Committee

Associate Editor: Annals of Applied Statistics

Pan-American Advanced Studies Institutes: Organizer, Multivariate Spatial Statistics Workshop

Tom Manteuffel

APPM Numerical Analysis Preliminary Exam Committee, Promotion and Tenure Committee

SIAM Science Policy Committee

Advisory Board: Bravarian Graduate School of Computational Engineering; Fundamental and Computational Sciences Directorate, PNNL

Editorial Board: Numerical Linear Algebra and Applications, SIAM Journal on Numerical Analysis, SIAM Journal of Scientific Computing

Associate Editor: Electronic Transactions in Numerical Analysis

16th Copper Mt. Conference on Iterative Methods: Program Committee

Mark Hoefer

APPM 25th Anniversary Committee, Graduate Committee, PDE Preliminary Exam Committee

University Faculty Student Mentor Program

Guest Editor: Physica D on Dispersive Hydrodynamics

Organizer: Dispersive Hydrodynamics: The Mathematics of Dispersive Shock Waves and Applications

Congming Li

APPM PDE Preliminary Exam Committee, Post Tenure Review Committee; Chair for both

APPM Graduate Committee

University PUEC Committee: Vanja Dukic

Editorial Board: Discrete and Continuous Dynamical System A, Acta Mathematica Scientia

Organizer: 10th AIMS Conference on Dynamical Systems, Differential Equations and Applications; 2nd STJU Summer School on Nonlinear Partial Differential Equations; Workshop on the analysis of partial differential equations III

Per-Gunnar Martinsson

APPM Graduate Committee Chair

APPM Executive Committee

A&S Graduate Education Committee

Associate Editor: SIAM Journal of Scientific Computation, Advances in Computational Mathematics

Organizing Committee: ICERM Workshop on Computational Methods, 2016 IABEM Conference



James Meiss

APPM Executive Committee,
Graduate Committee

Boulder Faculty Assembly Libraries
Committee

University PUEC committee: Vanja
Dukic

Editor: "Mappings" in
Dynamical Systems Encyclopedia,
Applied Mathematics Encyclopedia at
Scholarpedia

Editorial Board: SIAM Books

Harvey Segur

APPM Faculty Search Committee

University Distinguished Research
Lecture Committee

Adam Norris

APPM Undergraduate Committee

Advisor: Theta Tau student
organization

Boulder Faculty Student Mentor
Program

Boulder Faculty Assembly: At-Large
A&S representative; Instructor-Track
Faculty Affairs committee, co-chair;
Executive Committee; Committee on
Office of Discrimination and
Harassment; Leadership Institute;
Elections and Nominations
Committee, chair

Juan Restrepo

APPM PDE Preliminary Exam
Committee, Faculty Search
Committee, Graduate Committee

IQ Biology: Graduate Mentoring
Committee, Admissions Committee

Advisory Board: Chaos (journal)



Department of Applied Mathematics 2014 Annual Report

Teaching Activities

Undergraduate Courses Taught by Department Personnel

Spring Semester 2014

APPM 1235	Ann DeFranco Sandra Williams	Pre-Calculus for Engineers
APPM 1340	Jonathan Kish	Calculus 1A with Algebra
APPM 1345	Silva Chang	Calculus 1B with Algebra
APPM 1350	Murray Cox Ryan Croke	Calculus I for Engineers
APPM 1360	Sujeet Bhat Silva Chang Murray Cox Kevin Manley	Calculus II for Engineers
APPM 2350	Christian Ketelsen Adam Norris	Calculus III for Engineers
APPM 2360	Michael Calkins Anne Dougherty Keith Julien Philippe Marti Michael Ostroski	Introduction to Ordinary Differential Equations with Linear Algebra
APPM 2450 APPM 2460	<i>Graduate Students</i> <i>Graduate Students</i>	Calculus III Lab Differential Equations Lab
APPM 3050	Adam Norris	Scientific Computing in Matlab
APPM 3310	James D. Meiss	Matrix Methods
APPM 3570	Sujeet Bhat William Kleiber	Applied Probability
APPM 4360	Douglas Baldwin Ryan Croke	Complex Variables
APPM 4390	Sarthok Sircar	Modeling in Mathematical Biology
APPM 4450	Anne Dougherty	Undergraduate Applied Analysis
APPM 4540	William Kleiber	Introduction to Time Series
APPM 4570	Yolanda Hagar-Slichter	Statistical Methods
APPM 4590	Vanja Dukic	Statistical Modeling
APPM 4660	Juan Restrepo	Intermediate Numerical Analysis 2
APPM 4720	Christian Ketelsen	Topics in Applied Mathematics - Computational Linear Algebra
APPM 4950-801 APPM 4950-802	Adam Norris Adam Norris	Seminar in APPM: "Ant Seminar" Seminar in APPM: "Tensor Analysis"

Summer 2014 - Terms A and C

APPM summer courses have been, until this year, taught only in the eight-week C Term at CU Boulder, and the lower division courses are normally taught by our graduate students. In 2014, adjunct professor and NCAR researcher Doug Nychka offered a seminar course in the A Term.

APPM 1350	Ruth Martin	Calculus I for Engineers
APPM 1360	Tony Wong Meredith Plumley	Calculus II for Engineers
APPM 2350-300	David Nieves Dale Jennings	Calculus III for Engineers
APPM 2360	Ed Yasutake Michael Ostroski	Introduction to Ordinary Differential Equations with Linear Algebra
APPM 2450	Rebecca Mitchell and Rachel Tutmaher	Calculus III Lab
APPM 2460	Zach Mullen	Differential Equations Lab
APPM 3310	Sujeet Bhat	Matrix Methods
APPM 4650	Adam Norris	Intermediate Numerical Analysis 1
APPM 4720/5720	Douglas Nychka	Topics in Applied Mathematics: Methods and Analysis of Large Data Sets

Fall Semester 2014

APPM 1235	Ryan Croke Ann DeFranco Yolanda Hagar-Slichter Jack Olsen Sandra Williams	Pre-Calculus for Engineers
APPM 1340	Silva Chang	Calculus 1A with Algebra
APPM 1350	Sujeet Bhat Murray Cox Ryan Croke James H. Curry Jonathan Kish	Calculus I for Engineers
APPM 1360	Silva Chang Murray Cox Congming Li	Calculus II for Engineers
APPM 2350	Christian Ketelsen Adam Norris Sergey Voronin	Calculus III for Engineers
APPM 2360	Mark Hofer Yiping Ma Per-Gunnar Martinsson	Introduction to Ordinary Differential Equations with Linear Algebra
APPM 2450 APPM 2460	<i>Graduate Students</i> <i>Graduate Students</i>	Calculus III Lab Differential Equations Lab
APPM 3170	Sujeet Bhat	Discrete Applied Mathematics

Fall Semester 2014 (cont.)

APPM 3310	Gregory Beylkin Christian Ketelsen	Matrix Methods
APPM 3350	Adam Norris	Adv. Engineering Calc.
APPM 3570	Igor Rumanov	Applied Probability
APPM 4350	Harvey Segur	Methods in Applied Math I (Fourier Series)
APPM 4380	Bengt Fornberg	Modeling in APPM
APPM 4440	Anne Dougherty	Undergraduate Applied Analysis
APPM 4520	Jem Corcoran	Introduction to Mathematical Statistics
APPM 4560	Manuel Lladser	Markov Processes
APPM 4650	Tom Manteuffel	Intermediate Numerical Analysis 1

Graduate Courses Taught by Department Personnel

Spring Semester 2014

APPM 5360	Douglas Baldwin Ryan Croke	Complex Variables
APPM 5390	Sarthok Sircar	Modeling in Mathematical Biology
APPM 5450	Per-Gunnar Martinsson	Applied Analysis 2
APPM 5460	Juan Restrepo	Dynamical Systems/Differential Equations/Chaos
APPM 5540	William Kleiiber	Introduction to Time Series
APPM 5570	Yolanda Hagar-Slichter	Statistical Methods
APPM 5590	Vanja Dukic	Statistical Modeling
APPM 5610	Gregory Beylkin	Numerical Analysis 2
APPM 6640	Steve McCormick	Multigrid Methods
APPM 7400-006 APPM 7400-005	Per-Gunnar Martinsson Gregory Beylkin	Topics in Applied Mathematics - Introduction to Research Topics in Applied Mathematics - Multiresolution Algorithms

Fall Semester 2014

APPM 5350	Harvey Segur	Methods in Applied Math I (Fourier Series)
APPM 5380	Bengt Fornberg	Modeling in APPM
APPM 5430	Mark J. Ablowitz	Complex Variables
APPM 5440	Stephen Becker	Applied Analysis I
APPM 5470	Congming Li	Methods of Applied Mathematics 3: PDEs
APPM 5520	Jem Corcoran	Introduction to Mathematical Statistics
APPM 5560	Manuel Lladser	Markov Processes
APPM 5600	Bengt Fornberg	Numerical Analysis I
APPM 6610	Tom Manteuffel	Introduction to Numerical PDEs
APPM 7400-003	Sujeet Bhat	Topics in Applied Mathematics - Teaching Excellence

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

APPM 4120/5120	Spring 2014	Alejandro Spina, Mathematics	Operations Research
APPM 4520	Spring 2014	Sergei Kuznetsov, Mathematics	Introduction to Mathematical Statistics
APPM 4570/5570	Spring 2014	Ray Littlejohn, Engineering Mgt	Introduction to Applied Statistics
APPM 4580/5580	Spring 2014	Ray Littlejohn, Engineering Mgt.	Statistical Methods of Data
APPM 4650	Spring 2014	Alejandro Spina, Mathematics	Intermediate Numerical Analysis 1
APPM 4720	Spring 2014	Michael J. Stutzer, Finance	Math Finance 1
APPM 4520	Summer 2014	Alejandro Spina, Mathematics	Introduction to Mathematical Statistics

Courses Offered by Other Departments, Taught by APPM Personnel

COEN 1236	Spring and Fall 2014	<i>Graduate Students</i>	Pre-Calculus Workgroup
COEN 1350	Spring and Fall 2014	<i>Graduate Students</i>	Calculus 1 Workgroup
COEN 1360	Spring and Fall 2014	<i>Graduate Students</i>	Calculus 2 Workgroup
COEN 2350	Spring and Fall 2014	<i>Graduate Students</i>	Calculus 3 Workgroup
MCEN 3012	Summer 2014	Adam Norris	Thermodynamics





Department of Applied Mathematics
526 UCB
1111 Engineering Drive
ECOT 225
Boulder, CO 80309-

<http://amath.colorado.edu>

