A photograph of a university campus at dusk. The sky is a deep blue with a small white star visible. In the foreground, there are silhouettes of trees and a building. The text is overlaid on the sky.

Department of
Applied Mathematics
The University of Colorado at Boulder

2014-2015 Newsletter

Department of Applied Mathematics Newsletter 2014-2015

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Faculty and Staff

Department Chair: Mark Ablowitz, Professor

Associate Department Chair: Anne Dougherty, Senior Instructor

Chair of Graduate Studies: Per-Gunnar Martinsson, Associate Professor

Faculty

Mark Ablowitz, *Professor*
 Gregory Beylkin, *Professor*
 James H. Curry, *Professor*
 Bengt Fornberg, *Professor*
 Keith Julien, *Professor*
 Congming Li, *Professor*
 Tom Mantueffel, *Professor*
 James Meiss, *Professor*
 Harvey Segur, *Professor*
 David Bortz, *Associate Professor*
 Jem Corcoran, *Associate Professor*
 Vanja Dukic, *Associate Professor*
 Manuel Lladser, *Associate Professor*
 Per-Gunnar Martinsson, *Associate Professor*
 Stephen Becker, *Assistant Professor*
 Mark Hoefer, *Assistant Professor*
 William Kleiber, *Assistant Professor*
 Juan G. Restrepo, *Assistant Professor*
 Jerrold Bebernes, *Professor Emeritus*
 Bob Easton, *Professor Emeritus*
 Steve McCormick, *Professor Emeritus*
 John Williamson, *Professor Emeritus*
 (Deceased March 30, 2015)
 Anne Dougherty, *Senior Instructor*
 Adam Norris, *Senior Instructor*
 Sujeet Bhat, *Instructor*
 Murray Cox, *Instructor*
 Ryan Croke, *Instructor*
 Christian Ketelsen, *Instructor*
 Yolanda Hagar-Slichter, *Instructor, Research Associate*
 Yiping Ma, *Instructor, Research Associate*
 Sergey Voronin, *Instructor, Research Associate*
 Silva Chang, *Lecturer*
 Ann DeFranco, *Lecturer*

Jonathan Kish, *Lecturer*
 Jack Olsen, *Lecturer*
 Eric Thaler, *Lecturer*
 Ilana Trumble, *Lecturer*
 Sandy Williams, *Lecturer*
 Michael A. Calkins, *Lecturer, Research Associate*
 Philippe Marti, *Lecturer, Research Associate*
 Igor Rumanov, *Lecturer, Research Associate*
 Marian Brezina, *Research Associate*
 Lucas Monzon, *Research Associate*
 John Ruge, *Research Associate*
 Chris Leibs, *Research Associate*
 Steffan Muenzemaier, *Research Associate*
 Benjamin Miquel, *Research Associate*

Staff

Mary Fentress, *Program Manager*
 Catriona Allcock, *Graduate Program Assistant*
 Matthew Clifford, *Graduate Program Assistant*
 Ian Cunningham, *Office Coordinator, Undergraduate Program Assistant*
 Anna Gonzales, *Accounting Tech*
 Meg Kwiat, *Student Assistant*
 Michael Onischuk, *Student Assistant*
 Eva Lambeck, *Newsletter Writer*
 Danielle Hawley, *Newsletter Writer*
 William Marquis, *IT Manager*
 Jay LeCavalier, *Computer Tech*
 Vidyadhar Deodhar, *Computer Tech*

Visiting Scholars

Ali Demirci, *Pennsylvania State University, Turkey*
 Mario Bautista, *GM Powertrain Torino, Italy*
 Ecio Lacocca, *Chalmers University of Technology, Sweden*

Affiliated Faculty and Adjunct Faculty

Affiliated Faculty

Meredith Betterton, *Department of Physics*
Elizabeth Bradley, *Department of Computer Science*
Richard Byrd, *Department of Computer Science*
Xiao-Chuan Cai, *Department of Computer Science*
John Cary, *Department of Physics*
Aaron Clauset, *Department of Computer Science*
John Crimaldi, *Department of Civil, Environmental, and Architectural Engineering*
Thomas DeGrand, *Department of Physics*
Alizera Doostan, *Department of Aerospace Engineering*
Scot Elkington, *Laboratory for Atmospheric and Space Physics*
Samuel Flaxman, *Department of Ecology and Evolutionary Biology*
Natasha Flyer, *Institute for Math Applied to Geosciences*
Baylor Fox-Kemper, *Cooperative Institute for Research in Environmental Sciences, Brown University*
Debra Goldberg, *Department of Computer Science*
Thomas Hauser, *OIT Administration*
Ute Herzfeld, *Cooperative Institute for Research in Environmental Sciences*
Minhaly Horanyi, *Laboratory for Atmospheric and Space Physics*
Christine Hryena, *Department of Chemical and Biological Engineering*
Elizabeth Jessup, *Department of Computer Science*
Dhinaker Kompala, *Department of Chemical and Biological Engineering*
Manuel Laguna, *LEEDS School of Business*
Francios Meyer, *Department of Electrical, Computer, and Energy Engineering*
Nathalie Moyaen, *LEEDS School of Business*
David Noone, *Cooperative Institute for Research in Environmental Sciences, University of Oregon*

Lev Ostrovsky, *Zel Technologies*
Scott Parker, *Department of Physics*
Harihar Rajaram, *Department of Civil, Environmental, and Architectural Engineering*
Steve Sain, *Institute for Math Applied to Geosciences*
Siram Sankaranarayanan, *Department of Computer Science*
Daniel Scheeres, *Department of Aerospace Engineering and Space Physics*
Michael Shull, *Department of Astrophysical and Planetary Sciences*
James Syvitski, *INSTAAR*
Juri Toomre, *Department of Astrophysical and Planetary Sciences*
Henry Tufo, *Department of Computer Science*
Mahesh Varanasi, *Department of Electrical, Computer, and Energy Engineering*
Franck Vernerey, *Department of Civil, Environmental, and Architectural Engineering*
Patrick Weidman, *Department of Mechanical Engineering*
Jeffrey Weiss, *Department of Astrophysical and Planetary Sciences*
Joseph Werne, *Colorado Research Associates*

Adjunct Faculty

Aimé Fournier, *Mesoscale and Microscale Laboratory, NCAR*
Fred Glover, *College of Engineering and Applied Science*
Hector Lomeli Ortega, *Instituto Tecnológico Autónomo de México*
Annick Pouquet, *Geophysical Turbulence Program, NCAR*



Ph.D. and Masters Student Graduates

December 2014 – May 2015

David J. Appelhans, Ph.D.

Trading Computation for Communication: A Low Communication Algorithm for the Parallel Solution of PDEs Using Range Decomposition, Nested Iteration, and Adaptive Mesh Refinement

Michael Brutz, Ph.D.

Mathematical Modelling and Analysis of Several Diffusive Processes

Sijia Hao, Ph.D.

Numerical Methods for Solving Linear Elliptic PDEs: Direct Solvers and High Order Accurate Discretizations

Christopher A. Leibs, Ph.D.

First-Order Systems Least-Squares Finite Element Methods and Nested Iteration for Electromagnetic Two-Fluid Kinetic-Based Plasma Models

Nathan D. Monnig, Ph.D.

From Nonlinear Embedding to Graph Distances: A Spectral Perspective

Henry P Romero, Ph.D.

Fundamental Limits of Network Communication with General Message Sets: A Combinatorial Approach

Raymond Dao, M.S.

Probabilistic and Statistical Methods for Target Tracking

Hillary Fairbanks, M.S.

Non-thesis

Alyson Fox, M.S.

Non-thesis

A.T. Le, M.S.

Spatially Random Processes in One-Dimensional Maps: The Logistic Map and The Arnold Circle Map

Cristian R. Mendoza, M.S.

Rays, Waves, and Separatrices

Ben O'Neill, M.S.

Non-thesis

Ignas Satkauskas, M.S.

Non-thesis

Ben Southworth, M.S.

Non-thesis

Li Wang, M.S.

Non-thesis

Letter from the Chair: Mark Ablowitz

The past three years have been very busy -- and exhilarating. In what follows, I will summarize many of the critical issues and developments that occurred in the Applied Mathematics Department (APPM) during the past three years.

About a month after taking over as chair on July 1, 2012 the Program Manager (PM) informed us that she needed to take a twelve week family leave. Luckily we were fortunate to find a university retiree, V. Nelson, who was able to run the critical functions of the PM position. The PM resigned after her family leave. Relatively soon after my taking over as Chair, we also lost our accounting tech staff member and our graduate staff member. Nelson was instrumental in helping us find her own replacement, M. Fentress, who began in late Spring 2013. In due course we were able to find excellent staff to replace those who left: A. Gonzalez and C. Allcock.

Another important staff position is our IT professional. In 2013 D. Baldwin helped revise our web page platform to run under Drupal. He recruited W. Marquis to replace him in 2014 and in addition we hired student IT support staff. Unfortunately, in late April 2015 Marquis had to relocate back to Massachusetts. We are currently recruiting for a replacement; in fact, it was recently announced that J. Tafoya was hired as our IT professional.

Soon after July 2012, APPM began to see significant increases in the number of students (and student credit hours) we teach. Indeed this was, and continues due to the College of Engineering decision to increase its undergraduate engineering enrollment. This, in turn, has led APPM to expand its faculty base. We are also hopeful that APPM will be able to expand our statistics efforts and will be able to offer a BA in statistics in the next few years.

From 2012 to 2015 APPM hired four assistant professors:

S. Becker (beginning 2014; Becker replaced S. McCormick who retired December 2013 and is now Professor Emeritus), M. Hoefer (2014), I. Grooms (2015), Z. Kilpatrick (2016). We hope that APPM will be able to hire another assistant professor in Stochastic Processes and Applications beginning fall 2016. It should be noted that proposals for each of these lines had to be approved by numerous committees, the Associate Dean and the Dean of Arts and Sciences (A&S).

We hope that the increased enrollment will lead to additional future tenure track faculty lines.

In order to be able to teach the large number of new students taking APPM courses, we also have hired a number of instructors: M. Cox (2013), C. Ketelson (2013), R. Croke (2013), and B. Zaharatos (2015). Croke resigned his position as of May 2015; he is being replaced by B. Fry (2015).

Unfortunately as the College of Engineering enrollment has increased, substantial strain has been placed on available space for APPM in the engineering center. Recently the Dean of Engineering has indicated that a new building on the East campus might be built to hold the Aero Engineering Department. If this comes to fruition, it might allow APPM some breathing room for space considerations. In the long run, perhaps an 'H-wing' would provide the best alternative for APPM.

Over this three year period, we had three successful retentions, one successful tenure promotion of an Associate Professor (D. Bortz, 2014) and this year, two successful promotions to Professor (V. Dukic and P. Martinsson).

Our external research support has increased as well.

\$1.58m (PI-APPM) + 1.499 (Affiliates) = \$3.057m total for 2012

to

\$2.47m (PI-APPM) + 1.938 (Affiliates) = \$4.425m total for 2013

to

\$3.547m (PI-APPM) + 1.336 (Affiliates) = \$4.883m for 2014

In 2014-15, APPM celebrated its 25th anniversary as an independent unit within the College of A&S.

We look forward to many more successful years.

Mark J. Ablowitz



Awards

Faculty Awards

Mark Albowitz, Department Chair, Professor

2014 Martin Kruskal Prize

The Martin Kruskal Prize, established in 2012, is awarded every two years for a notable body of mathematics and contributions in the field of nonlinear waves and coherent structures. The award may be given either for a single notable achievement or for a collection of such achievements.

Vanja Dukic, Associate Professor

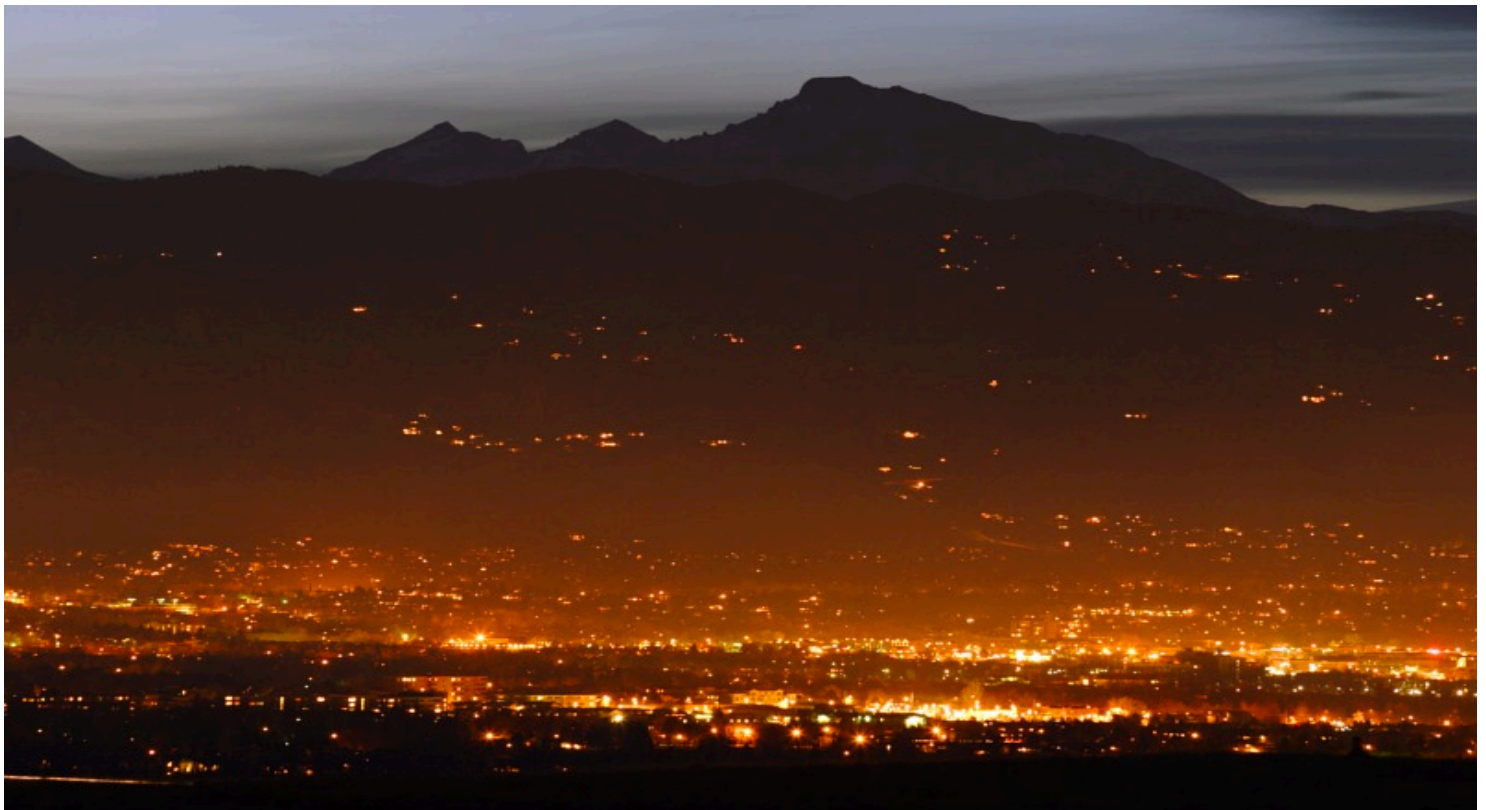
2015 American Statistical Association Fellow

Dukic is one of sixty-two statisticians to be named fellows in the 2015 round of ASA fellow elections for her outstanding contributions to the statistical professions throughout her scholarly career. The ASA prides itself on advancing research, promoting sound statistical practice to inform public policy, and improving human welfare.

Adam Norris, Senior Instructor

BFA Faculty Recognition Award

The Faculty Recognition Award is given to faculty members who demonstrate continued support of the CU community through their service activities. Professor Rolf Norgaard said that, “Adam has been involved in many endeavors across campus including service on ITFAC and the Boulder Faculty Assembly (BFA)...His effective interpersonal manner and communication skills are an asset to the BFA. In addition, he has a great



Students Awards

Michelle Maiden, Graduate Student

Chancellor's Fellowship Program

Only the most outstanding entering graduate students of the University of Colorado at Boulder are awarded this fellowship. Departments nominate their most promising graduate applicants, and from these impressive students, the top applicants are awarded.

Rees McNally, Graduate Student

Outstanding Graduate for Research

Rees has worked in the Colorado Space Grant Consortium on satellites for two and a half years. He has also worked in the Lawrence Livermore National Lab in California on compressed sensing and in JILA on the optical lattice clock.

Ben Southworth, Graduate Student

U.S. Department of Defense Fellowship

Department of Defense fellowships are awarded to graduate students of science and engineering that have shown special aptitude for advanced training in their field. Each year only 200 fellowships are granted, and the selection process is highly competitive.

Ilana Trumble, Graduate Student (Graduated December 2014)

Outstanding Graduate of College

Trumble has done research at the Anschutz Medical Campus with University of Colorado Cancer Center surveying mutation data of kinases, which are common targets for drugs to treat cancer patients.

Tony Wong, Graduate Student

CIRES Graduate Student Research Award

The Cooperative Institute for Research in Environmental Sciences wishes to promote research excellence. The program aims to attract those with high aptitude at the beginning of graduate careers.



Warm Welcomes

New Faculty



Stephen Becker, *Assistant Professor*

Stephen Becker received his PhD in Applied Mathematics from the California Institute for Technology, and spent two years as a postdoctoral fellow at Paris 6 University, and a year as a Goldstine fellow at IBM Research in New York. His research is in computational mathematics and involves optimization, randomization, big-data techniques, signal processing, and compressed sensing. He grew up in Boulder and is very happy to be back. His wife, Kim, teaches physics at Centaurus High School. In their free time, he and Kim like to take their two daughters to the mountains.

Mark Hoefer, *Assistant Professor*

When not making or studying nonlinear waves, Mark Hoefer enjoys experiencing waves in nature. He is married to Jill and has a small dog, Piper -- a Snorkie that loves to lick people. He is a long-time Vipassana meditator and values early mornings. His commute to and from CU is on his bicycle.



New Staff



Catriona Allcock, *APPM Graduate Student Coordinator*

Trina was born in the UK but moved to Indiana when she was six, where she grew up. She has a degree in psychology from Purdue University and a degree in general studies from Iowa University. In 2007 she joined the National Guard and was a combat medic until 2010, when she became a logistics and ordinance officer. She recently moved to Boulder and began her new position as the APPM Graduate Student Coordinator because she fell in love with Boulder after visiting. She likes to mountain bike, backpack, hike, ski, and be outdoors.

New Postdoctoral Fellows

Chris Leibs, *Postdoctoral Fellow*

After receiving his PHD in Applied Mathematics from the University of Colorado Boulder in 2014, Chris decided to stay at CU and continue his research with the Grandview Computational Math Group. He focuses mainly on computational plasma physics, multilevel methods, and numerical PDEs, but is also interested in high performance computing, and math education. He collaborates with researchers from Los Alamos National Laboratory, Lawrence Livermore National Laboratory, the University of Illinois, and the United States Air Force. Chris and his fiancée, Ruth, live in Boulder and enjoy taking their dogs on hikes in the beautiful Front Range, as well as sampling from the large variety of locally brewed beverages.



New Postdoctoral Fellows (Continued)

Benjamin Miquel, *Postdoctoral Fellow*

Benjamin Miquel received his PhD in Physics from Ecole Normale Supérieure (Paris), and spent one year as a postdoctoral fellow at IRPHE (Université Aix-Marseille). His research is in Nonlinear Physics, and ranges from Wave Turbulence in various systems to Geophysical and Astrophysical fluid dynamics. His inveterate love for the outdoors takes him to the mountains during most of his free time.

Steffen Münzenmaier, *Postdoctoral Fellow*

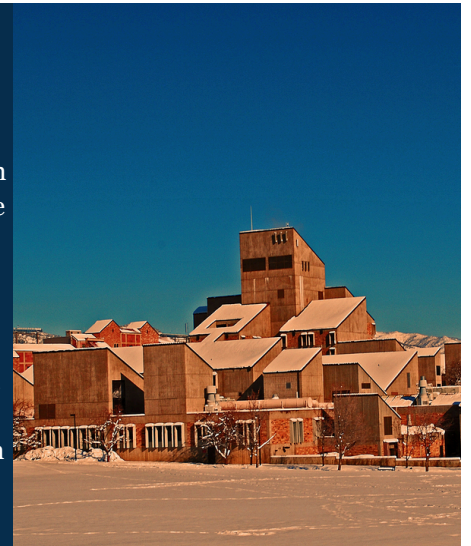
Steffen Münzenmaier received his PhD in Applied Mathematics from the Leibniz Universität Duisburg-Essen as a research associate in 2013. Since February 2015, he has worked as a research associate at the University of Colorado at Boulder. His field of research is the efficient numerical solution of partial differential equations with applications in fluid mechanics such as coupled surface/groundwater flows. While not solving mathematical problems, he likes to hike in the mountains or take his bike for a ride.



2014-2015 Highlights

APPM Celebrates 25 Years of History

Applied Mathematics is central to science and engineering education. The roots of Applied Mathematics at CU-Boulder go back to the turn of the last century when it was a Department of Engineering Mathematics. It was reformed in 1989 as an independent program and soon became the Department of Applied Mathematics. The growth has been remarkable. The Department now offers BS, MS, and Ph.D. degrees in Applied Mathematics; it teaches thousands of students and has a major research presence in computational and physical/biological mathematics and the statistical sciences. It is expanding to twenty tenure tracks in the next two years. In addition, there are six full time instructors, more than 70 graduate students, about 150 Applied Math majors, 100 minors, and a thriving BS-MS Program. Thank you to past alumni who presented and attended the 25th celebration: Lora Billings, Dan Cooley, Mary van der Heijde, Theodoros Horikis, James Keiser, Edgar Knobloch, Laura Mather, and Saverio Spagnolie.

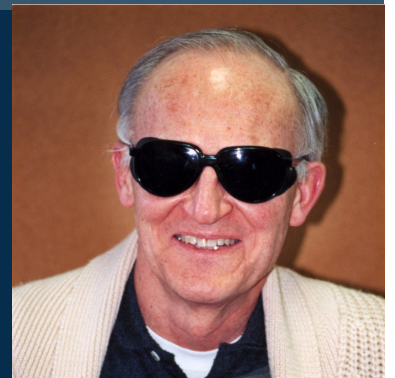


Per-Gunnar Martinsson CBMS Lecture Series

Professor Per-Gunnar Martinsson was invited to present a series of ten lectures at Dartmouth College in June 2014. The lectures were the main feature of a meeting sponsored by the Conference Board of Mathematical Sciences (CBMS) and the National Science Foundation, surveyed a body of work developed by Professor Martinsson over the last ten years, concerning so called “fast solvers” for elliptic partial differential equations. Selection as a CBMS speaker is highly competitive, with less than ten selected from across all the mathematics science each year.

In Remembrance of Professor Emeritus John Williamson

On March 30, 2015 former CU Professor Emeritus John Alexander Williamson passed away. Williamson accepted a position with the university in 1967 and remained until his retirement in 2005. His academic work focused on probability, statistics, and mathematical biology. His many achievements include Best Paper Award from the International Genetic Epidemiology Society and high ratings from his students throughout his many years teaching. The Applied Mathematics Department and his family has created a scholarship in his name. <https://www.cufund.org/giving-opportunities/fund-description/?id=17625>



**We invite you to contribute to our
Annual Fund Drive.**

**Tax-deductible donations can be
made here:**

<http://amath.colorado.edu/content/donate>

**Department of Applied Mathematics
University of Colorado at Boulder**

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