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Department Chair: Keith Julien

Associate Department Chair: Anne Dougherty

Graduate Committee Chair: William Kleiber

PROFESSORS:
Mark Ablowitz
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James Curry
Vanja Dukic
Bengt Fornberg
Mark Hoefer
Keith Julien
James Meiss
François Meyer
Harvey Segur

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Jem Corcoran
Zachary Kilpatrick
William Kleiber
Manuel Lladser
Juan Restrepo
Eric Vance

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Adrianna Gillman
Ian Grooms
Yu-Jui Huang
Maziar Raissi
Nancy Rodriguez

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Lev Ostrovsky

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Bob Easton
Congming Li
Tom Manteuffel
Steve McCormick

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Adam Norris
Brian Zaharatos

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Silva Chang
Nathan Duignan
Tahra Eissa
Jonathan Kish
Judith Law
Sean Nixon
Osita Onyejekwe
Maribeth Oscamou
Eric Thaler

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Daniel (Seneca) Lindsey
Richard McNamara
Igor Rumanov

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Nathan Duignan
Tahra Eissa
Nick Featherstone
Brad Hindman
Jessica Kenigson
Nora Loose
Pablo Lorca
Lucas Monzon
Sean Nixon
Igor Rumanov

Affiliated Faculty

Alireza Doostan - Aerospace Engineering
John Evans - Aerospace Engineering
Tomoko Matsuo - Aerospace Engineering
Daniel Scheeres - Aerospace Engineering

Juri Toomre - Astrophysical & Planetary Sciences

Julie Lundquist - Atmospheric and Oceanic Sciences
Jeffrey B Weiss - Atmospheric and Oceanic Sciences

Fatemah Pourahmadian - Civil Engineering

Elizabeth Bradley - Computer Science
Jed Brown - Computer Science
Xiao-Chuan Cai - Computer Science
Aaron Clauset - Computer Science
Rafael Frongillo - Computer Science
Daniel Larremore - Computer Science
Sriram Sankaranarayanan - Computer Science
Henry Tufo - Computer Science

Natasha Flyer - Department of Applied Mathematics

Carlos Martins-Filho - Economics

Ute Herzfeld - CIRES, Electrical, Computer and Energy Engineering
Emiliano Dall'Anese - Electrical, Computer and Energy Engineering

John Crimaldi - Civil Engineering, Environment & Architecture Engineering

Dave Frits - GATS Inc

Ana Maria Rey - JILA

Stephan Sain - Jupiter Intelligence

Scot Elkington - Lab for Atmospheric and Space Physics

Manuel Laguna - Leeds School of Business
Nathalie Moyen - Leeds School of Business

Sean O'Rourke - Mathematics

Franck Vernerey - Mechanical Engineering
Patrick Weidman - Mechanical Engineering

Aimé Fournier - Earth, Atmospheric and Planetary Science; Massachusetts Institute of Technology

Annick Pouquet - National Center for Atmospheric Research

Meredith Betterton - Physics
Michael Calkins - Physics
John Cary - Physics
Mihály Horányi – Physics, Lab for Atmospheric and Space Physics
Scott Parker - Physics

Thomas Hauser - Research Computing

Department Staff

Ian Cunningham - Office Coordinator, Undergraduate Program Assistant

Mary Fentress - Program Manager

Laura Gooch - Graduate Student Coordinator

Desiree Holtz - Accounting Technitian

Dominique Ingoglia - IT Manager

Kyle Zhou - IT Assistant

Patrick McCreery - Department Writer, Newsletter Editor

Doctor of Philosophy Graduates

Sabina Altus:
Multi-structured population models and analysis of their associated semigroups.
Dissertation Advisor: David Bortz (APPM)

Lewis Baker:
Inference of Multiple Diffusion Coefficients from Single Particle Trajectories
Dissertation Advisor: David Bortz (APPM)

Alec Dunton:
Matrix Methods for Data Compression in Large-Scale Applications
Dissertation Advisor: Alireza Doostan (Aerospace Engineering Sciences)

Fortino Garcia:
Numerical Methods for Wave Phenomena
Dissertation Advisor: Daniel Appelö (Michigan State University)

David Gunderman:
High-order spatial discretization and numerical integration schemes for curved geometries
Dissertation Advisor: John A. Evans (Aerospace Engineering Sciences)
and Bengt Fornberg (APPM)

Erik Johnson:
Malarial genetics, imaging resolution, vaccine efficacy, oh my!
Dissertation Advisor: Dan Larremore (Computer Science) and Stephen Becker (APPM)

Osman Malik:
Topics in Matrix and Tensor Computations
Dissertation Advisor: Stephen Becker (APPM)

Joy Mueller:
Advances in Statistical Edge Detection
Dissertation Advisor: Jem N. Corcoran (APPM)

Jeremy Thompson:
Local Fourier Analysis of P-Multgrid and Domain Decomposition Methods for
High-Order Finite Elements
Dissertation Advisor: Jed Brown (Computer Science)

Lucia Minah Yang:
Numerical Analysis of Mixed Precision Algorithms and Time-steppers for Wave
Turbulence, and Generative Modeling for Analogs in Data Assimilation
Dissertation Advisor: Ian Grooms (APPM)

Graduating Class of 2021

Master of Science

Nicholas Barendregt
Stevan Maksimovic
Abram Ellison
Caleb Penner
Daniel Ferguson
David Stearns
Emily Jakobs
Emily Webb
Shalini Mahanthege

Professional Master of Science

Nicholas Ambruz
Adam Litzler
Finnian Bender
Rachel Annelise Lynch
James Cates
Julie Matthias
Christopher Craig
Joshua Mellin
Angela Folz
Samuel Radack
Aser Garcia
Jacob Tiede
Laurette Hamlin
Justus Tulowiecki
Ksenia Lepikhina
Christopher Zimmer

Bachelor of Science in Applied Mathematics

Omar Alterkait
Spas Angelov†
Damien Beecroft†
Noelle Boyton
Brandon Cage†
Kaitlin Coleman
Joseph Dunbar‡
Noah Francis
Jimmy Gammell†
Jamie George
Jonathan Guay
Reed Harrington
Abigail Hause
Jack Holland†
Lilac Intrater
Eli Johnson
Kaushik Kannan‡
Grant Kellogg‡
Holden Kjerland-Nicoletti
Spencer Koelsch‡
Dennis Krimer
Kyle Li
David Perkins†
Adam Rosa‡
Perrin Ruth†
Andrew Starr†
Jackson Trust
Seth Taddiken
Ruijing Wang
Garrett West
Harrison Wolf
Andrew Yee†
Alexander Zimmerman

Bachelor of Arts in Statistics and Data Science

Trent Collins
Andrew Maclean
Adam Hayes‡
Jingzhi Zhang

"On behalf of the faculty and staff of Applied Mathematics, ***Congratulations Class of 2021!*** *We wish to express our deepest admiration of your dedication and perseverance in achieving your educational goals during such a trying period in our history. We welcome you as new alumni. Wishing you the very best."*

- Keith Julien, Professor and Department Chair

† Summa Cum Laude
‡ Engineering Honors

Graduate Awards

Academic Engagement Award:

Erica Landreth, AMEN BS

Jenna Trost, CHEN BS + AMEN BS

Global Engagement Award:

Emily Zuetell, MCEN BS + AMEN BS

Justice, Equity, Diversity & Inclusion (JEDI) Award:

Shu-Yu (Michelle) Lin, ASEN BS + AMEN BS

Research Award:

Jimmy Gammell, ECEN BS + AMEN BS
Simon Julien, AMEN BS
Shu-Yu (Michelle) Lin, ASEN BS + AMEN BS
Jenna Trost, CHEN BS + AMEN BS

Outstanding Graduate of the College:

Emily Zuetell, MCEN BS + AMEN BS

Introductions and Promotions

Welcoming Dr. Judith Law

This fall, Applied Math welcomed Dr. Judith Law to the Professional Master's Program as the Associate Director!

As a researcher, Dr. Law is interested primarily in hierarchical and Bayesian statistics. Her interest in this area stems her time as a PhD student at the University of Maryland when she took a course in small area estimation. Upon earning her PhD in Applied Statistics, Dr. Law became a Postdoctoral Research Scientist at the Harvard Medical School's Department of Health Care. During her time there, Dr. Law modeled a separable covariance structure that is the sum of a set of Kronecker products. Dr. Law earned an MBA from the Wharton School of the University of Pennsylvania and worked in corporate finance for many years.

The years that I spent working after receiving my MBA and before joining the PhD program have given me insight into how business leaders make decisions and formulate strategy. I know that better decisions could be made in many arenas with the use of modern statistical methods.

-Dr. Law

Professor Mark Hoefer

&

Associate Professoer Zachary Kilpatrick

At the beginning of the academic year, Dr. Mark Hoefer was promoted from Associate Professor to full Professor.

Furthermore, Dr. Zachary Kilpatrick was promoted from Assistant Professor to Associate Professor.

A Year in Review: News and Events

Rudy Horne Fellowship Recipient: Serena DiLeonardo

At the beginning of the academic year, the Department of Applied Mathematics announced the recipient of the Rudy Horne Memorial Fellowship: graduate student Serena DiLeonardo!

Serena is a first year student in the Applied Mathematics graduate program who previously graduated with a Bachelor of Science in Mathematics along with a Master's Degree in Environmental Science at the City University of New York. Serena's lifelong passion for environmental studies pushed her to earn her Master's Degree in the field. Ms. DiLeonardo explained:

"During and after my graduate studies, I'm interested in tackling environmental problems with techniques in applied mathematics. I am a passionate environmentalist, and believe that environmental issues resulting from climate change affect every person on this planet."

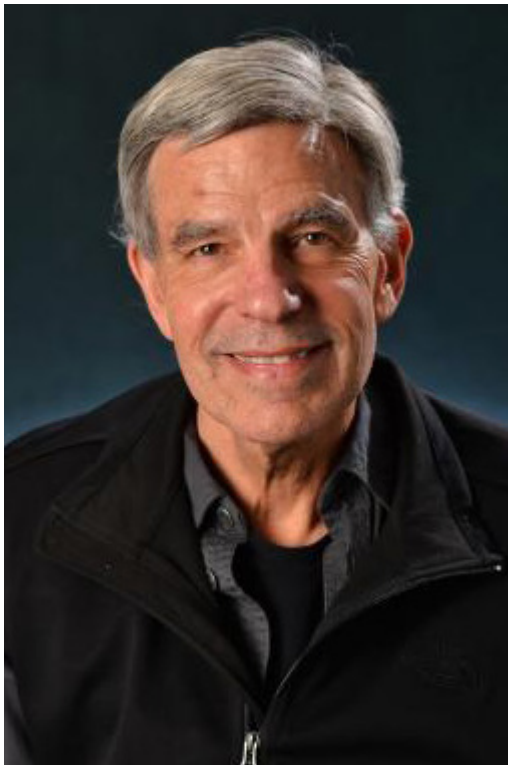
The Rudy Horne Memorial Fellowship, as stated by the Applied Math Department, was founded with the hope that fellowship recipients "would, through their presence in the department, contribute to the diversity of the department of Applied Mathematics and of the campus, and more generally, of the community of mathematicians." Serena commented on the privilege and duty that this fellowship comes with, saying:

"I am touched to have been awarded this fellowship in the name of Rudy Horne. I very much look up to him and countless others who have overcome tremendous obstacles to achieve their dreams, while motivating others to do the same .... This fellowship motivates me even further to work as hard as I can to be a voice and force for positive change by collaborating to come up with actionable solutions to some of the most pressing global issues."

Serena emphasizes that teams tackling important problems should include students of underrepresented backgrounds in STEM. More specifically, Serena expressed her desire to work with the Association for Women in Mathematics (AWM): "I would love to work with AWM to achieve their goals of promoting diversity through outreach, attending conferences and cultural events. I very much would like to work toward increasing the number of underrepresented students in fields of sciences and technology."

"There are countless unanswered questions facing society right now requiring new and innovative solutions, and there is no doubt that a diverse group will be able to answer these questions more creatively."

Distinguished Professor Mark Ablowitz



Applied Mathematics Professor Mark Ablowitz was named CU Distinguished Professor by the CU Board of Regents on November 12, 2020. The title "Distinguished Professor" is the highest honor that the University of Colorado bestows on its own faculty members. Mark Ablowitz joins a cohort of only 118 faculty (since 1977) across all five CU campuses who have been granted this honorary designation. As noted by Applied Mathematics Professor and Department Chair Keith Julien, "Mark is the first faculty in the Department of Applied Mathematics' 31 year history to receive this prestigious honor." Mark Ablowitz was recognized for his groundbreaking research, academic leadership, and prolific mentoring and teaching over a career spanning more than 50 years.

He has made groundbreaking contributions to the fields of nonlinear waves, integrable systems, fluid mechanics, and nonlinear optics. From the light we see and the ocean swells we surf down to the most fundamental description of matter itself, waves are ubiquitous in nature. Their mathematical description is essential for both understanding fundamental physical processes as well as harnessing their potential in applications. Mark Ablowitz's research focuses on the derivation and analysis of nonlinear partial differential equations while always keeping concrete applications in sight. From more familiar applications like water waves and fiber optic communications, to more exotic states of matter like photonic graphene and Bose-Einstein condensates, his research reverberates far and wide, with new model equations, analysis techniques, and predictions that he has produced preoccupying mathematicians, physicists, and engineers alike.

After serving as Dean of Science at Clarkson University in Potsdam, NY, Mark Ablowitz came to CU Boulder in 1989 as the founder and Director of the newly formed Program in Applied Mathematics. His direction and leadership led to eight years of rapid growth and the creation of the Department of Applied Mathematics in 1996, for which Mark Ablowitz served as the inaugural chair. The Department is now recognized as a world-class applied mathematics department, ranked 14th in the nation by US News & World Report and highly ranked by the National Research Council in its 2010 decadal survey.

In all aspects of scholarly life, Mark Ablowitz truly embodies the title of CU Distinguished Professor. Congratulations Distinguished Professor Mark Ablowitz!

If you would like to read more about Mark Ablowitz's accomplishment and the other Professors elevated to Distinguished Professior, CU Boulder Today published an article discussing this year's newly designated distinguished professors.

2022 U.S. News & World Report Graduate Program Rankings

At the end of March, U.S. News & World Report released their graduate program rankings, which included improvements in the rankings of many graduatue programs at CU Boulder. The Applied Mathematics Department holds it's position from 2018 at 14th overall in the nation in applied math programs. The 2018 rankings were not updated this year, but the 2016 engineering rankings were updated.

As a whole, the College of Engineering and Applied Science ranks 26th overall in the nation among public universities. The aerospace (10th) engineering program ranked in the top 10 overall in their respective field. Furthermore, the chemical (14th), civil (20th), biological (21st), and environmental (14th) engineering programs breached the top 25 overall for their fields.

College of Arts & Sciences Employee of the Year: Mary Fentress

Applied Mathematics Program Manager, Mary Fentress, has been named a College of Arts & Sciences Employee of the Year! The A&S Dean's Staff Advisory Committee released a statement recognizing Mary's success:

"Your leadership, innovative drive, and unfailing devotion to your team were qualities celebrated by your colleagues who nominated you for this award. You were recognized repeatedly for your professionalism, wealth of institutional knowledge, and effective management of the Department of Applied Mathematics.

Applied Mathematics Department Chair expressed his support in Mary's winning the award, saying that "APPM is very fortunate and honored to have such a dedicated member of our department ... Congratulations Mary!"

Only some of the most impactful staff receive this award, with the Staff Advisory Committee stating that the award is given "in recognition and appreciation of exceptional job performance." Furthermore, those who win the award should consistently show "outstanding performance in all areas of their job ... inspire leadership in the department ... [and provide] outstanding service to campus and the surrounding community."

Computational Science Fellowship Recipient: Rachel Robey

In September of 2020, Applied Mathematics doctoral candidate Rachel Robey received a Department of Energy Computational Science Graduate Fellowship, DOE CSGF for short. Rachel, who is a member of Daniel Appelö's research group, was one of 26 doctoral researchers who were given the award to support and further their research in the field of applied math. Part of the fellowship ensures that Rachel will be conducting research at one of a plethora of research laboratories that the Department of Energy owns and manages.

This fellowship emphasizes the importance of high-performing computation which is leveraged to solve important, complex science and engineering problems that face the nation today. Because of the high importance and specificity of the fellowship, recipients are asked to complete courses in engineering, computer science, or applied mathematics before moving on to work at a DOE laboratory.

In a statement from the Department of Energy and the Krell Institute (a corporation founded in support of this fellowship), this fellowship and subsequent experience is an "effective workforce recruitment tool for the national laboratories. Nearly a quarter of all DOE CSGF alumni work or have worked in a DOE lab setting. Others pursue careers in academia, industry or government, where they introduce and advocate for computational science as a tool for discovery." Overall, this program awards fellowships to doctoral students and since "1991, the DOE CSGF has supported more than 500 students at more than 70 universities."

The Applied Math Department congratulates Rachel Robey on this momentous opportunity! For more information on the DOE CSGF or the Krell Institute, visit their webpage.

GraphChallenge Winner: Alec Dunton

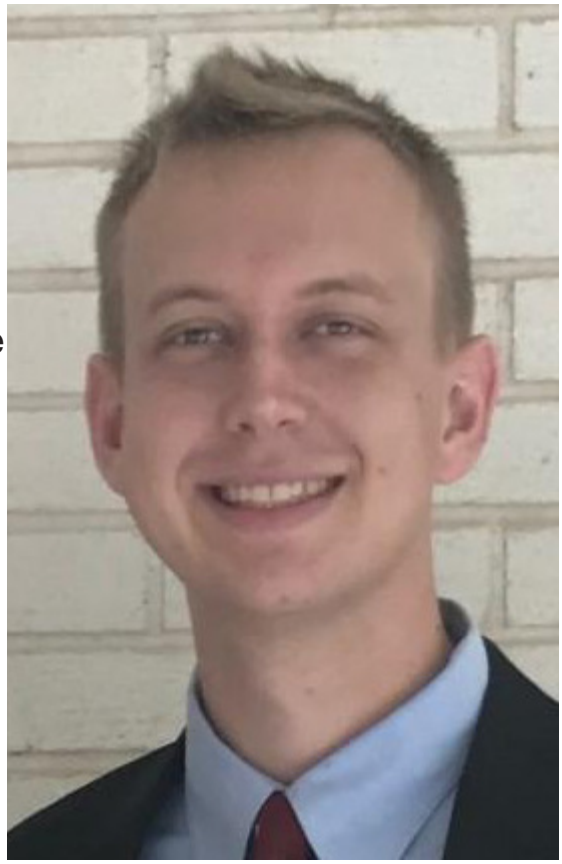
In September of 2020, Applied Mathematics graduate student Alec Dunton and his team won the Graph Challenge as a part of his summer internship at Lawrence Livermore National Laboratory. The GraphChallenge, as explained on the challenge's website, is a curated and open scalable graph analysis competition which "encourages community approaches to developing new solutions for analyzing graphs and sparse data derived from social media, sensor feeds, and scientific data to enable relationships between events to be discovered as they unfold in the field." It has been a yearly fixture at the IEEE High Performance Extreme Computing (HPEC) conference since 2017, and solicits innovative advances to pressing problems such as counting subgraph isomorphisms and clustering streaming graphs.

Alec's team, composed of Benjamin W. Priest (Postdoctoral Researcher, Lawrence Livermore National Laboratory) and Geoffrey Sanders (APPM PhD Alumnus), published the winning paper (titled: Scaling Graph Clustering with Distributed Sketches) in which the team proposes "a graph clustering algorithm which circumvents scalability issues inherent in traditional methods such as spectral clustering." The underlying goal of the challenge was to identify optimal clusters in a large graph stored in distributed memory. In order to achieve this, Alec explains:

"The unsupervised learning of community structure is a canonical, well studied problem in graph analysis. Our contribution is an algorithm which utilizes random projection to produce embeddings which achieve performant clustering results for fully-dynamic streaming graph models. Instead of relying on an expensive eigendecomposition computation as in spectral clustering approaches, we use the fast Johnson-Lindenstrauss and CountSketch transforms directly to embed a graph-dependent matrix. These linear dimension reduction approaches, used in tandem with the nonlinear embedding algorithm UMAP, produce low dimensional representations which enable efficient clustering of large-scale graphs. Our method could significantly improve graph clustering performance in distributed memory."

The Department congratulates Alec on this impressive achievement!

Graduate Part-Time Instructor Award Winner: David Gunderman



In November, Applied Mathematics Department congratulated David Gunderman for receiving the Fall 2020 Graduate Part-Time Instructor Appreciation Award. Over the course of the last 30 years, the Graduate School has awarded Graduate Part-Time Instructor Teaching Excellence Awards. However, this year, in light of the ongoing campus challenges, the Graduate School created the Graduate Part-Time Instructor Appreciation award to recognize graduate students who have taken on the challenge of teaching during the pandemic and ongoing fluid campus situation.

David, who joined the department in the Fall of 2016, is currently a PhD candidate who plans to defend his thesis this Spring. David's research is centered around high order numerical methods for solving Partial Differential Equations. As part of a project funded by Lawrence Livermore National Laboratory, David explains that he is "developing highly accurate, efficient integration techniques for geometrically-complicated 3D domains with applications to computational fluid dynamics and fluid-structure interaction."

"I've always loved teaching. I enjoy the intellectual and social challenge of finding the best way to present complex concepts to students. During my time as a student, I have noticed the enormous difference that dedicated teachers have made in my life, both academically and otherwise. I hope to pay that forward."

- David Gunderman

Research Highlight:

The Effect of Heterogeneity on Hypergraph Contagion Models

In November, Associate Professor Juan G. Restrepo and Applied Math PhD student Nicholas Landry published their work titled "The effect of heterogeneity on hypergraph contagion models" along with a press release.

Nicholas, who has been studying the dynamics of networks, and Prof. Restrepo wanted to look at the effects of social interactions on group dynamics when it comes to the spread of a contagion, which could be a rumor, meme, virus, or anything of that nature that can spread among groups. Furthermore, the pair of researchers wanted to look at the effect of the size of social groups on the tipping point of contagion flow. The tipping point is a critical point where the rate of spread of the contagion jumps up and becomes an epidemic. The distribution and variability of social interactions is critical for determining this tipping point, and this is precisely what was studied and outlined in the paper published.

In a Twitter thread on Nicholas's page, he explains that "Contagion models are well-studied on pairwise networks, but lately, researchers have been interested in the effect of including group interactions. We know that often ideas or opinions can become viral or die out, depending on whether they reach a 'critical mass'." In their work, however, they apply this in a way to investigate how the heterogeneity of individual and group structure impacts the tipping point. "We looked at several different pairwise degree distributions and two different ways to connect nodes in groups of three." In doing this, they discovered that with a more heterogeneous contact structure "in your individual connections makes tipping points less likely and more heterogeneity in the number of group connections tends to make tipping points more likely."

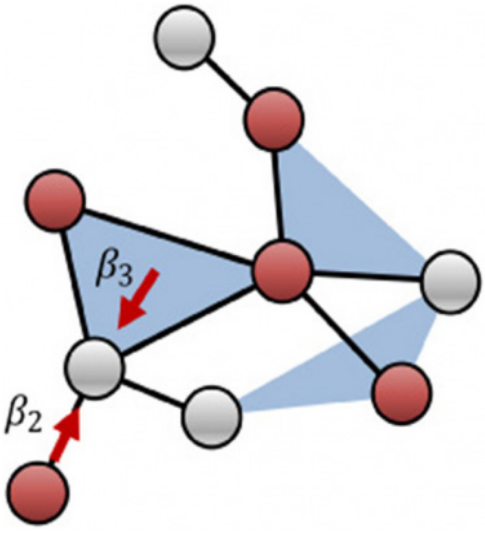
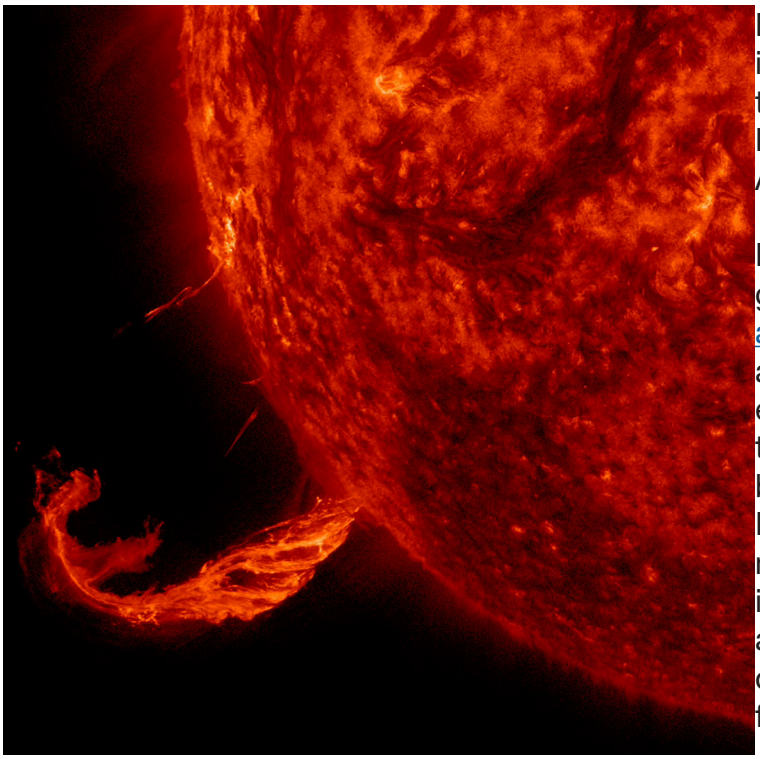


Figure: Illustration of a hypergraph. Infected nodes (red) infect a healthy node (gray)

In the future, they hope to extend their project by applying the model to real data and exploring the effect of other structural characteristics present in real world social networks.

To read more about this project, read the paper, a news article published by Newswise, the press release itself, or visit Nicholas's Twitter thread, which breaks down the project nicely.

Research Highlight:
Building AI to Study the Sun



Last year, a grant to study solar weather using machine learning was funded, and among those working on the project, the Applied Math Department's own Professor James Meiss and Affiliate Dr. Natasha Flyer are highlighted.

In an article released by the College of Engineering & Applied Sciences titled Building artificial intelligence to study the sun, Dr. Meiss and Dr. Flyer are listed as partners on the project that aims to better forecast solar weather that impacts satellite communications at Earth by using artifical intelligence/machine learning. In being able to forecast solar flares and coronal mass ejections more accurately, it gives warning to those on Earth that may be impacted, as well as gives time to brace for any ensuing outages to satellite communications, which are fundamental to many aspects of modern life.

For more information on the project, read the original article posted by the College of Engineering & Applied Sciences, or visit the Space Weather Technoloy, Research and Education Center website.

Assistant Professor Nancy Rodriguez receives NSF CAREER Award

Applied Mathematics Assistant Professor Nancy Rodriguez won the National Science Foundation's Faculty Early Career Development Program (CAREER) award, which is presented to junior faculty who show passion and excellence in both areas of research and education. This award comes with a grant that aims to support the research and educational activities of the winners.

In an article by Colorado Arts and Sciences Magazine, Dr. Rodriguez explains that she plans on using the award's financial support to research "the role of movement in ecological systems or redistribution within economic systems," to "develop and study models for human rioting," and finally to "develop a multi-scale model for crime from a public health perspective" using work in mathematical epidemiology.

More on Dr. Rodriguez and her pretigious award can be found in the article originally published by Colorado Arts and Sciences Magazine.

Fortino Garcia Awarded Mathematical Sciences Postdoctoral Research Fellowship

Last year, Applied Mathematics graduate student Fortino Garcia was awarded an NSF Mathematical Sciences Postdoctoral Research Fellowship.

Fortino proposed to investigate numerical methods for open quantum systems. Specifically, Fortino will analyze a Multilevel Monte Carlo (MLMC) method for a dimension-reducing quantum trajectory approach for open quantum systems. The MLMC quantum trajectory method will be applied to a quantum control problem to devise waveforms that will ultimately be used to enact quantum logic gate operations on near-term quantum computing platforms.

Fortino plans to carry out his research at the Courant Institute at New York University under the mentorship of Professor Georg Stadler. The purpose of the prestigious Mathematical Sciences Postdoctoral Research Fellowships (MSPRF) is to support future leaders in mathematics and statistics by facilitating their participation in postdoctoral research environments that will have maximal impact on their future scientific development. Awards will support research in areas of mathematics and statistics, including applications to other disciplines.

As a graduate student at Applied Mathematics, Fortino has worked together with Professor Daniel Appelö on numerical methods for wave propagation as well as on a project in collaboration with Lawrence Livermore National Laboratory researchers Dr. Anders Petersson and Dr. Jonathan DuBois on numerical methods for control and characterization of quantum computers.

The Department congratulates Fortino on this impressive achievement!

Kate Bubar: National Science Foundation Graduate Research Fellowship Program Awardee

Applied Mathematics graduate student Kate Bubar was recently awarded a fellowship through the National Science Foundation (NSF) Graduate Research Fellowship Program (GRFP). The NSF GRFP was created to "help ensure the quality, vitality, and diversity of the scientific and engineering workforce of the United States. The program recognizes and supports outstanding graduate students," and will support Kate for the duration of the three year fellowship.

Kate is currently working in the Larremore Lab and is a member of the IQ Biology program, interested broadly in the "tools and theory at the intersection of math and biology that have applications to pressing issues, like improving health and living standards around the world." Currently, however, Kate's research revolves around the question of vaccine prioritization, relating to the distribution of the COVID vaccine and beyond.

In the NSF's description of the Graduate Research Fellowship Program, they emphasized that they provide support to graduate students in order to "maintain and advance the nation's technological infrastructure." Vaccine distribution, as exemplified during this pandemic, plays a critical part in technological infrastructure.

With respect to the IQ Biology program, Kate emphasized that "the goals of the IQ Biology program go hand-in-hand with the goals of the GFRP". Kate elaborated, explaining that science "is becoming increasingly interdisciplinary and some of the best/most innovative technologies are created at the intersection of different scientific fields … The IQ Biology program gave [her] the confidence and ability to work effectively with scientists in a broad range of fields like immunology, ecology, public health and computer science."

The GRFP will help Kate in being able to participate in not only research initiatives, but outreach initiatives as well, saying that the GRFP "will enable me to dedicate more of my time to research, outreach and science communication. It will also make it easier for me to pursue new collaborations and opportunities since I have my own funding." Kate mentioned that she is "passionate about various outreach initiatives to support diversity in STEM and improve science communication."

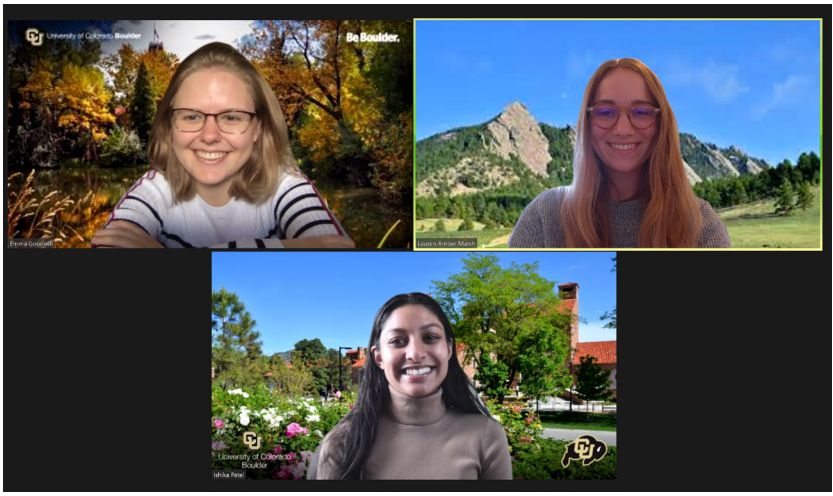
"I was originally interested in this topic with regards to the COVID vaccines. Now, I am thinking about the mathematics underlying vaccine prioritization in general, and if we can make a generic plan for who is best to prioritize when there are scarce resources."

- Kate Bubar

CU Boulder MCM/ICM Contest Results

In late April, the Consortium for Mathematics and Its Applications (COMAP) released the results of the Mathematical Contest in Modeling (MCM) and Interdisciplinary Contest in Modeling (ICM). Each year, COMAP hosts modeling competitions that undergraduates from universities across the globe compete in. The COMAP web page explains that the MCM "challenges teams of students to clarify, analyze, and propose solutions to open-ended problems," while the ICM "is designed to develop and advance interdisciplinary problem-solving skills as well as competence in written communication." At CU, the teams are co-sponsored by the Applied Math Department (APPM) and the Engineering Honors Program (EHP). The students are majoring in applied math or in one of the engineering or science disciplines.

After the competition, COMAP recognizes the top papers with an Outstanding designation as well as with named awards from several professional societies. In relation to the possible awards given, and of most relevance to this year's results for CU, the MAA Award is given by the Mathematical Association of America, while the SIAM Award is given by the Society for Industrial and Applied Mathematics. Teams from CU have historically been extremely successful since they began participating almost 25 years ago, and this year was no exception. Department Chair Keith Julien explained CU's success, saying that "since 2008, APPM/CU-EHP has won 14 Outstandings and 17 named Prizes/scholarships. This still remains the most named prizes—Shanghai Jiao Tong is second with 8—but Shanghai Jiao Tong has passed us now with 16 Outstandings. Tsinghua University is in third place with 8 Outstandings during this time period (2008-2021)."



This year, there were 26,112 teams participating; 36 teams were deemed Outstanding. One team from CU (with their team photo on the right), composed of students Emma Goodwill (top left), Lauren Marsh (top right), and Ishika Patel (bottom middle), was given one of only four COMAP Scholarships. They also received the MAA Award and SIAM Award. This team tackled Problem C, which "investigated the discovery and sightings of Vespa mandarinia (also known as the Asian giant hornet) in the State of Washington."

A separate CU team, composed of Branson Camp, Aloha Churchill, and Steven Oakes, received the Finalist designation and the MAA Award for their work with Problem B. Problem B "used the scenario of the 2019-2020 fire season in Australia, which saw devastating wildfires in every state, to consider the use of drones in firefighting."

The success of CU's MCM/ICM teams are sustained by APPM's Associate Department Chair Anne Dougherty. Dr. Dougherty plays a critical role in organizing, putting together, and preparing the teams for the contests each year, saying:

"Working with Professors Bengt Fornberg and Manuel Lladser, we've recruited students, had training sessions, registered teams, and pushed things along a bit. In our training sessions, we talk with the students about the contest to tell them what to expect, how to prepare, and how to succeed. If they're not prepared and organized, they won't do as well."

Scot Douglass of the Engineering Honors Program and Dr. Dougherty recruit students from various majors to create teams that have many strengths. Dr. Dougherty explained that "The best teams have students with complementary skills and backgrounds … CU's students are top students in the world, and you can see that in the success of our teams." Organizing teams each year has clearly been successful, and Dr. Dougherty explained that the consistent participation of teams has fostered "a tradition of success that is passed down from one team to the next."

In Memoriam

Jack Woodhull

In January, the Department of Applied Mathematics recently learned of the passing of high impact alumnus, John Richard "Jack" Woodhull. Jack graduated from CU Boulder with a bachelor's degree in engineering physics in 1957 and in 1960, returned to CU to earn a master's degree in Applied Mathematics after serving as a Lieutenant in the U.S. Navy.

Woodhull's involvement with the U.S. Armed Forces was a theme throughout his career, as he would find success in the private sector, serving as president and CEO of defense sector heavyweight, Logicon, Inc. Jack held this position from 1969 until 1998 when Northrop Grumman merged with Logicon, a billion-dollar acquisition when adjusted for inflation. Logicon was a leader in providing advanced technology systems, hardware, software, and other services to the Department of Defense, the Navy, the Air Force, the Department of Justice, and other government agencies.

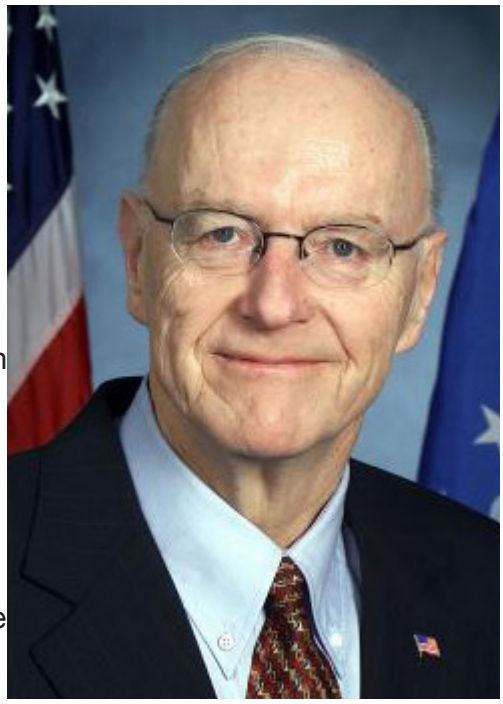
Woodhull's involvement with the University of Colorado, and especially the Applied Math Department, did not end upon his graduation. He was an active member of the CU community, serving on the University of Colorado Foundation Board of Directors and the Engineering Advisory Council. In fact, he was Chairman of the Engineering and Applied Science College's Centennial Campaign that raised over $57.5 million dollars in the early 1990s.

Of particular note was that Jack spearheaded an investment in the newly created Applied Mathematics program on the Boulder campus. He created an endowment fund that survives to this day as the J.R. Woodhull/Logicon Teaching Professorship, the first of its kind on the Boulder Campus. Dr. Anne Dougherty is the current teaching professor, and Professor Jim Curry held the position from 1999 to 2012. The purpose of the professorship is to support undergraduate applied mathematics education, as Jack believed that engineering students would be best prepared with dedicated applied mathematics education that addressed real world problems that would be supplementary to a student's engineering education.

> "Each year I wrote a summary of the department's accomplishments and the ones I remember were to accelerate undergraduate research opportunities ... and helping to raise the ranking of the Department in the National Academies of Sciences ranking of Applied Mathematics department. I attribute these foundational accomplishments and transformation to the strong support of Mr. "Jack" Woodhull and especially his love and support of future generations of engineering student's excellence."
>
> **-Professor James Curry**

The Department mourns the passing of a strong and impactful member of the CU family who was a major contributor in the history of Applied Mathematics and whose generosity survives to this day. His legacy will live on for the students who benefit from his vision. More information about the life and successes of Jack Woodhull can be found in his obituary.

Peter Teets



In November, the University of Colorado lost Peter Teets, a distinguished alumnus of the original Applied Mathematics department on the Boulder campus. Teets graduated in 1963 with a Bachelor of Science degree in applied mathematics and two years later, a Master of Science degree, also in applied mathematics, from the Denver campus. In 1978, he attended Massachusetts Institute of Technology and earned a second master's degree in management.

By the time he graduated from MIT, Teets had already risen from engineer to manager and then to director of space systems at Martin Marietta in Denver. In 1985, Teets became president of Martin Marietta Denver Aerospace. In 1997, when Martin Marietta merged with Lockheed Corporation to form Lockheed Martin, Teets was selected as chief operating officer of the newly named industry icon.

He left the private sector in 2001 when President George W. Bush appointed him as director of the National Reconnaissance Office. He then served at the Pentagon as undersecretary of the Air Force for four years. During his time in the Bush administration, Teets pioneered "a comprehensive national security space enterprise, laying the groundwork for the integration of open and classified space activities in support of national security objectives," according to the National Reconnaissance Office. "He greatly improved the acquisition, operation, and effectiveness of national security space capabilities."

Throughout his accomplished career, Teets accrued significant honors and recognition reflecting his dedication to his work and the impact he had in his field. Among the many impressive awards he received was the W. Stuart Symington Award, given to civilians with significant contributions to national defense.

Teets remained strongly connected to the University over the years, serving as a member of the College of Engineering and Applied Science's Engineering Advisory Council in the 1980s and early 1990s. His advocacy for a renewed engineering focus on math led to the launch of the Applied Mathematics program in 1989, which went on to become a full department.

"Pete spoke often of the value of his applied mathematics degree as he navigated both his engineering-related positions and his leadership roles," said Enid Ablowitz, who was the director of development for the College of Engineering while Teets served on the EAC and remains close with the Teets family. "He was an articulate advocate for the return, growth and importance of an applied mathematics department and was particularly vocal about how his applied math education was foundational to his career successes. Often he would say that his broad understanding of engineering through the interdisciplinary lens of applied mathematics was a unique perspective and a powerful asset."

> "Applied Mathematics has been fortunate to have interactions with students like Mr. Peter Teets ... He helped transform the future."
>
> **- Professor James Curry**

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