

# **Math Students Put on an Outstanding Performance at 2022 William Lowell Putnam Mathematical Competition**

Charlotte Clark, Nelson Diaz, Ryan Firenze, Ben Gobler, John Mahoney, Sarah Meaney, Frederick Miller, Jakob Misbach, Margaret Munroe, Justin Shen, and Elliot Trilling participated in this prestigious mathematics competition involving students from the US and Canada.

These tests are extremely challenging-- the median score of all participants is often 0 or 1 (out of a maximum of 120). WPI's top scorer this year was Ben Gobler with a score of 20!! Congratulations, Ben!!

In addition, many thanks to Prof. Sam Tripp for his time and efforts training and leading this team effort.



## MAC majors compete in MAPFRE case competition

MAC majors Ngoc (Emerald) Pham, Eric Murdza, Gianni Camileo, and Kevin McGonigle competed on September 27, 2022, in an all-day case competition put on by MAPFRE. They collaborated together to determine the best combination of rates, reinsurance, expenses, and investments in order to maximize their total business value in a simulation. This competition relied on actuarial insurance, finance, and business knowledge to arrive at a solution where key decisions were presented to the audience and judges. The WPI team came in third place and competed against teams from local universities, including students in graduate programs. The group felt the competition was a remarkable way to learn how an insurance company must manage risk in a competitive market.

Congratulations to Emerald Pham, Eric Murdza, Gianni Camileo, and Kevin McGonigle! And Congratulations to our Actuarial Advisors, Profs. Jon Abraham and Barry Posterro for their leadership in the program!



## Francesca Bernardi awarded 5-year Simons Foundation Collaboration Grant for Mathematicians

[Francesca Bernardi](#) awarded new Simons Foundation Collaboration Grant for Mathematicians titled "Investigating diffusion and transport at the microscale." This 5-year grant is designed to enhance research through travel and inviting collaborators to WPI.

In Francesca's own words: "This funding will support my ongoing collaboration with the Harris Lab of PI Daniel M. Harris in the School of Engineering at Brown University. We developed a model based on the Fick-Jacobs equation suitable to describe diffusion in microchannels with dead-end pores of non-uniform cross-sections; experiments benchmarking this model are currently undergoing in my lab at WPI LEAP as part of an MQP project. Next, we are getting ready to consider the "reverse problem" to what we are currently working on, i.e. dislodging trapped particles from micropores, as well as diffusion in microchannels with wavy, absorbing, or superhydrophobic walls." For more information on this program, please see the [Simons Foundation webpage](#).



## Sam Walcott receives 3-year NSF award

[Sam Walcott](#) received the award from the [Integrative Research in Biology \(IntBIO\) Program](#) within the Directorate for Biological Sciences. This 3-year NSF award is titled "*IntBIO: Linking genome to phenome to understand function of an ancient muscle myosin*". This award is joint with [Nicolai Konow](#) (UMass Lowell PI), [Jeffrey R. Moore](#) (UMass Lowell), and [Matt Gage](#) (UMass Lowell). Sam is the PI on the WPI portion of the award and this collaborative research builds on a previously awarded WPI and UMass Lowell seed grant for interdisciplinary research.

*In Sam's own words:* Many animals have unique muscle proteins that occur in their jaw muscles. This muscle appears to be both strong and fast, violating the usual trade-off between muscle strength and speed where strong muscles are slow and fast muscles are weak. Rodents provide a unique system to examine these muscles since, of the two common types of squirrels around here, gray squirrels have these muscle proteins while red squirrels do not. In this project, my collaborators at UMass Lowell will collect data from red and gray squirrels at the scale of whole animals, isolated muscles, isolated muscle cells, and purified and engineered proteins. I will develop and use mathematical models to tie the experimental results together. In this way, we will determine how this muscle protein works and the trade-offs that have driven squirrel jaw muscle evolution. For more information, please see [this NSF page](#).

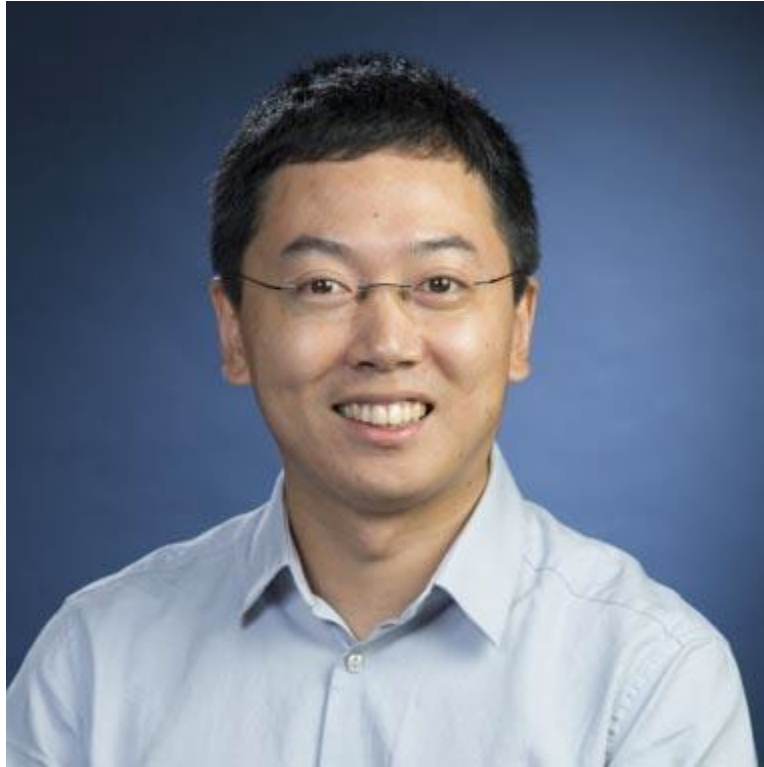


## Francesca Bernardi receives 3-year NSF award

Assistant Professor [Francesca Bernardi](#) received a new award from the National Science Foundation's Division of Chemical, Bioengineering, Environmental, and Transport Systems Program.

The 3-year NSF award is titled "Collaborative Research: Prechlorination, aging, and backwashing effects on spatiotemporal ultrafiltration fouling: Optimizing productivity by combining experiments and theory". This award is joint with Nicholas Cogan (Florida State University) and Shankar Chellam (Texas A&M). Francesca is the PI on the WPI portion of the award.

*In Francesca's own words:* This project aims at improving hollow-fiber ultrafiltration processes for wastewater reclamation. Numerous municipal facilities in the United States (and worldwide) utilize this mechanism to purify water for potable reuse. Typically, as wastewater flows through these hollow-fiber membranes, impurities are captured and occlude the pores in a process called "fouling;" this reduces the filtration efficiency and water production. Our project takes a synergistic approach by combining experimental investigations (at Texas A&M) with modeling and optimization efforts (at WPI and at FSU) to build theoretical/computational models of these membrane operations, which includes the spatiotemporal dependence of fouling and the effects of fiber geometry and packing density. For more information, please see [this NSF page](#).



## Professor Gu Wang awarded 3-year NSF Grant

This 3-year award is titled *Optimal Contracts and Optimal Stopping*. [Gu Wang](#) is the PI on this award from the Applied Mathematics Program at the National Science Foundation.

In Gu's own words: This project analyzes how contractual compensations are optimally designed and terminated in a principal-agent relationship, and the potential moral hazard due to the information asymmetry between the two parties. The goal is to develop new tools and strengthen existing ones in the optimal contract theory to incorporate optimal stopping, jump diffusions and agents who control the diffusion coefficient of the state variable. The expected results help us understand the agents' behavior under different contracts and have concrete applications in practice, for example, the risk exposure of portfolios chosen by asset managers for their investors, and the withdrawal behavior of insurance policy holders, which help regulate and design financial products, and improve welfare distribution among market participants. You can read more about this new award at the [NSF Award Info page](#).



## **Professor Stephan Sturm Co-Organizes the 2022 Gene Golub SIAM Summer School on Financial Analytics**

[Professor Stephan Sturm](#) received an award from SIAM to co-organize the Gene Golub SIAM Summer School (GS23) 2022. This award was a collaborative effort with F. Biagini (Munich), A. Capponi (Columbia), and S. Jaimungal (Toronto).

The summer school on "[Financial Analytics: Networks, Learning, and High-Performance Computing](#)" will be co-organized by Stephan Sturm, alongside other leaders in financial analytics. It will take place August 1-12 at the Gran Sasso Science Institute and allow advanced undergraduate and graduate students to learn about new and emerging areas while meeting faculty and students from around the world.



## Professor Chris Larsen receives 3-year National Science Foundation's Applied Mathematics Program award

[Professor Chris Larsen](#) receives 3-year award from the National Science Foundation's Applied Mathematics Program. The project is titled *Variational Fracture with Loads*.

In Professor Chris Larsen's own words: *Until recently, variational models for static and quasi-static fracture have been limited to Dirichlet boundary conditions, since there do not exist solutions to the seemingly most natural formulation that includes Neumann boundary conditions, i.e., boundary loads. The aim of the project is to improve on a recently introduced static formulation for variational fracture with boundary loads which can have solutions, and to extend this static model to the quasi-static case.*

For more information, please see the [NSF Award Info](#).





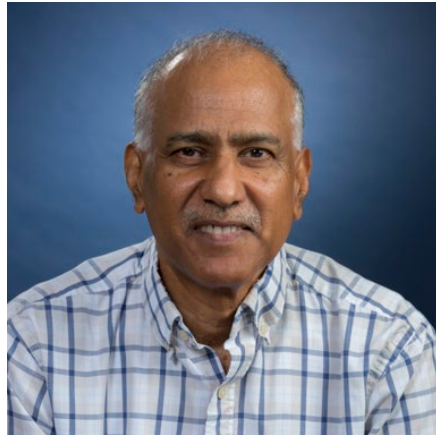
## **Professor Sam Walcott awarded WPI and UMass**

### **Lowell Seed Grant for Interdisciplinary Research**

[Sam Walcott](#) has been awarded a new WPI and UMass Lowell Seed Grant for Interdisciplinary Research. The research project is titled “Interdisciplinary understanding of muscle across scales: recovery after injury” and is a collaborative project with the following faculty from UMass Lowell: [Nicolai Konow](#) (Department of Biological Sciences), [Jeffrey R. Moore](#) (Department of Biological Sciences), and [Matt Gage](#) (Department of Chemistry).

In Sam's own words: To generate movement, humans and animals activate their muscles causing them to shorten. Muscles also sometimes act as brakes to dissipate energy, an eccentric contraction, where the muscle is forcibly lengthened after activation. Eccentric contraction damages muscle causing muscle soreness. Muscle then adapts to this damage, changing its molecular make-up and ultrastructure. In this project, we are examining this process across size scales. The Konow lab (UMass Lowell) will measure changes in whole muscle force generation for mice with and without damaging eccentric contraction; the Gage Lab (UMass Lowell) will measure changes in RNA and protein expression in those muscles; the Moore Lab (UMass Lowell) will use in vitro assays to measure changes in protein function in those muscles at the molecular and cellular scale. My role in the project is to use mathematical modeling to tie these experimental measurements together across the size scales -- roughly 7 orders of magnitude -- they span.

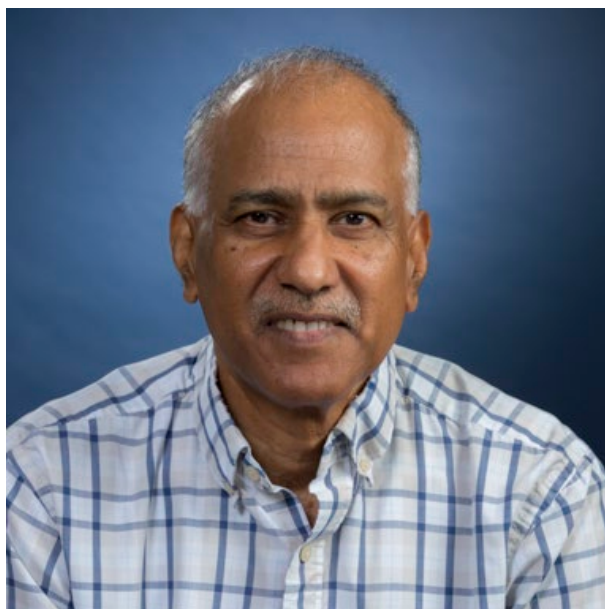
For more information, please visit: [https://www.wpi.edu/news/wpi-and-umass-lowell-award-seed-grants-interdisciplinary-research-teams?utm\\_source=WPI+Today+-+Mailing...](https://www.wpi.edu/news/wpi-and-umass-lowell-award-seed-grants-interdisciplinary-research-teams?utm_source=WPI+Today+-+Mailing...)



## **Professor Balgobin Nandram awarded Grant from the National Agricultural Statistics Service (NASS, USDA)**

The grant is titled "Bayesian Models for Cash Rents and Planted Acres of U.S. Counties". This grant is for the period May 2022 to April 2023 and the award is \$224,882.

In [Balgobin Nandram's](#) own words: This work at NASS is to develop Bayesian small area models to get reliable estimates of cash rental rates. I also advise researchers at NASS on the use of these small area models, which use Markov chain Monte Carlo methods extensively and routinely. NASS informs many crop insurance and agricultural support programs administered by other agencies such as the Farm Service Agency (FSA) and the Risk Management Agency (RMA). Many farmers rent their lands to other farmers, and it is useful to know annually what a fair price is by practice (irrigated, non-irrigated, and pasture land) for each of 49 states consisting of nearly 3000 counties with nearly two million operations. Data are collected in the annual Cash Rent Survey and other sources of information (e.g., the Census of Agriculture) are also used, particularly last year's data. It is also important to estimate planted acres ahead of time. Models must be operationalized to provide fast analysis and precise positive estimates of cash rental rates with standard errors. This is a very important on-going activity in the Research and Development Division at NASS because NASS is responsible to the US government to perform this research activity.



## **Balgobin Nandram receives two USDA National Agricultural Statistics Service (NASS) Awards for Excellence**

Professor [Balgobin Nandram](#) receives two awards for excellence from the National Agricultural Statistics Service (NASS), part of the United States Department of Agriculture (USDA). The first award is a team award for the CASH RENTS TEAM. This team is comprised of Lu Chen (one of Bal's PhD students), Nathan Cruz, Lori Harper, Michael Mathison, Balgobin Nandram, Jennifer Rhorer, Luca Sartore, and Tenopra Shepphard. This award was for terrific teamwork and technical expertise in implementing new Cash Rents statistics with an updated outlier identification process and a new modeling process. The second award, solely to Bal Nandram, was a Cooperator of the Year Award for his outstanding contributions in service to the Research and Development Division. These Awards for Excellence are for research that Bal Nandram has been doing for his prestigious grant award titled "Bayesian Models for Cash Rents of U.S. Counties".

# Congratulations to Jessica Wang and Ben Gobler for their excellent performance in this year's Kryptos competition

Ben and Jessica were among just nine of 77 teams who solved all three cryptography challenges. (See [here](#) for the three puzzles, the first of which is included below.) Based on their solution to all the problems in the contest, Wang & Gobler achieved the TURING level of achievement and now should be referred to as "Master Codebreakers".

The Kryptos competition is hosted annually by Central Washington University (coordinated by Professor Stuart Boersma); in their words "**κρυπτος** or kryptos, is a contest open to any and all undergraduate students. The theme of the contest is centered around the breaking, or cryptanalysis, of ciphers (secret writing)". This is not WPI's first strong showing in the competition: last year, Forrest Miller and Avery Smith achieved BABBAGE level.

For more information see:

<http://www.cwu.edu/math/kryptos>



## **Guanying Peng awarded 3-year Grant from the National Science Foundation's Applied Mathematics Program**

Assistant Professor [Guanying Peng](#) has been awarded a new 3-year grant from the National Science Foundation's Applied Mathematics Program. The project is titled *From Differential Inclusions to Variational Problems: Theory and Applications*.

In Guanying Peng's own words: Singularities are ubiquitous in nature. Examples include turbulence in fluid dynamics, folds in thin films, and defects in liquid crystals. The physical behavior around singularities is generally highly complex, posing great challenges to the efforts of understanding their formation, structure, and influence on neighboring regions. The knowledge of the nature of singularities is fundamental to predict a system's behavior or to develop effective applications for a material. This project considers systems in continuum mechanics and materials science that can be described directly or indirectly by a class of partial differential equations (PDE). The main goals include developing novel mathematical methods for analyzing this class of PDE and applying such new methods to better understand the nature of their singularities.

For further information, please

see: [https://www.nsf.gov/awardsearch/showAward?AWD\\_ID=2206291&HistoricalAwards=false](https://www.nsf.gov/awardsearch/showAward?AWD_ID=2206291&HistoricalAwards=false)

# **Congratulations to the Provost's MQP Award winners: Ben Gobler, Lexi Ferrini, Alison Lambert and Donovan Robillard**

Congratulations to Ben Gobler for winning the Provost's MQP Award for Mathematical Sciences!

MQP Project Title: The Calkin-Wilf Tree; Extensions and Applications

Advisors: Brigitte Servatius and Herman Servatius

Congratulations to Lexi Ferrini, Alison Lambert and Donovan Robillard for winning the Provost's MQP Award for Actuarial Mathematics!

MQP Project Title: Copula Modeling: An Application to Workers' Compensation Claims

Advisors: Jon Abraham and Barry Posterro

# Elisa Negrini wins 1st place in the GRIE for Mathematical, Chemical and Physical Sciences

[Elisa Negrini](#) competed in the [Graduate Research Innovation Exchange \(GRIE\)](#) and won 1st place for Mathematical, Chemical, and Physical Sciences for her presentation titled "A neural network ensemble approach to system identification".

In addition, on April 13th, Elisa Negrini successfully defended her PhD Dissertation titled "Robust Deep Learning Algorithms for System Identification".



## **Postdoctoral Scholar Duncan Wright named 2022-2023 American Mathematical Society Congressional Fellow**

[Duncan Wright](#), Mathematical Sciences Postdoctoral Scholar has been named the 2022-2023 [American Mathematical Society Congressional Fellow](#).

He will bring his mathematical expertise to a congressional office to shape decision-making processes that have societal impact.

Please read more from the [AMS announcement here](#).





## Francesca Bernardi awarded two grants to create and support Girls Talk Math (GTM) at WPI

[Professor Francesca Bernardi](#) has been awarded two grants for Girls Talk Math at WPI. Girls Talk Math (GTM) is a free two-week mathematics & media day camp with activities that embody WPI's motto of theory and practice; students from Worcester Public Schools will work at hands-on activities that will explore different aspects of technology and innovation. Camp will run at WPI on July 11th-22nd, Monday to Friday. The first award is for a grant titled "Girls Talk Math at WPI: A math and media camp to engage local girls and non-binary high school students," totaling over \$21,000 from the Women's Impact Network ([press release here](#)). The second award is a Mathematical Association of America Tensor Women & Mathematics Grant titled "Girls Talk Math at WPI: Improving students' attitude towards challenges and self-confidence through a math and media camp," totaling \$6,000.

# WPI To Host 38th Annual Mathematical Problems in Industry (MPI) Workshop

## June 13-17, 2022

MPI is a problem solving workshop that attracts leading applied mathematicians and scientists from universities, industry, and national laboratories. During the workshop, engineers and scientists from industry interact with the academic participants on problems of interest to their companies.

For further information please visit <https://labs.wpi.edu/cims/initiatives/mpi/>

[WPI Math REU](#)

Registration now open! Please fill out [this form](#) to register.



## **Min Wu awarded 5 year, \$450,000 NSF CAREER Award**

The 5-year, \$450,000 NSF CAREER Award is titled *CAREER: Probing Multiscale Growth Dynamics in Filamentous Cell Walls*. The Faculty Early Career Development (CAREER) Program offers the National Science Foundation's most prestigious awards in support of early-career faculty who have the potential to serve as academic role models in research and education and to lead advances in the mission of their department or organization. From [Professor Min Wu's](#) description of the proposed research: Various plants and fungi rely on filamentous growth to develop, reproduce, or survive under environmental stress. For example, the growth of root hairs with one-cell width effectively increases the surface area of the plant roots to absorb water and nutrients. Although experimental approaches have been able to track cell wall morphology and kinematics on the expanding cell wall surface for more than a century, the regulation of cell wall growth needs further elucidation. This project will develop mathematical models and computational methods to simulate the cell wall expansion due to the spatial patterning of new cell wall materials and mechanical interaction with the cell interior. Further, inference methods will be devised to predict the spatial patterning of wall-material trafficking from the cell wall geometry and quantify how volume growth inside the cell wall is distributed and rearranged to sustain the cell wall geometry during expansion and under mechanical constraints. The methods developed in this research can be applied to filamentous growth systems such as pollen tubes, root hairs, fungus hyphae, thus having significant implications in advancing agriculture and improving public health. Complementary to the research, the investigator will engage students, including K-12, undergraduate, and graduate students, in research mentorship, journal clubs, and a new interactive learning platform "Filaform", to promote interest and transdisciplinary understanding of this biological process by leveraging geometry and other mathematics in conjunction with modern and emerging experimental techniques. For more information please see: [https://www.nsf.gov/awardsearch/showAward?AWD\\_ID=2144372](https://www.nsf.gov/awardsearch/showAward?AWD_ID=2144372)



## **Barry Posterro Achieves the Designation of Associate of the Casualty Actuarial Society**

[Barry Posterro](#), Associate Teaching Professor in Mathematical Sciences has achieved the designation of Associate of the Casualty Actuarial Society (ACAS)! The Casualty Actuarial Society (CAS) is a professional society of actuaries specializing in the insurance of things (cars, homes, etc.) and also worker's compensation and professional liability policies. This significant achievement of ACAS is a culmination of successfully completing a comprehensive series of exams covering statistics, financial mathematics, actuarial statistics, financial markets, ratemaking, claim liabilities, as well as regulation and financial reporting. Congratulations, Barry!

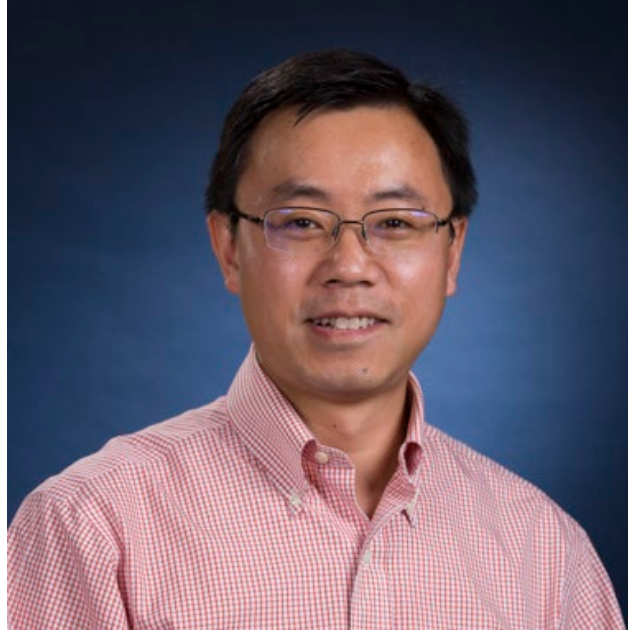


## **Sam Walcott awarded \$1.4 Million NIH Grant**

The NIH award is titled Collaborative Research: A Predictive Theory of Muscle Energy Consumption. This work will develop mathematical models to predict the amount of chemical energy that muscles need to contract, an advance that could lead to improved medical treatments and the creation of better prosthetic devices. This is in collaboration with Walter Herzog at the University of Calgary, Manoj Srinivasan at The Ohio State University, and Edward Debold at the University of Massachusetts, Amherst.

For more information, please see:

<https://www.wpi.edu/news/wpi-researcher-awarded-14-million-develop-model-predicts-energy-needed-muscle-movement>



## Zheyang Wu awarded \$200,000 NSF Grant

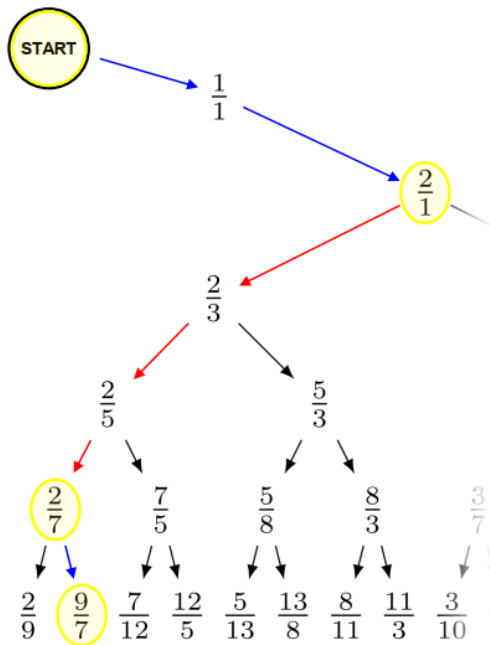
The 3-year award is titled *New Techniques to Combine Measures of Statistical Significance from Heterogeneous Data Sources with Application to Analysis of Genomic Data*. Professor Wu is the PI on this award from the Statistics Program at the National Science Foundation.

In [Professor Wu's](#) own words:

This project is motivated by integrative analysis of large-scale genomic data, where an important question is how to effectively combine statistical significances, or p-values, from heterogeneous data sources. Despite recent advances in theoretical and applied studies, statistical and computational challenges remain in addressing critical data features, such as complex correlations, discreteness of data, and high availability of prior knowledge that could have been utilized to boost signal detection. This project will develop novel statistical methods to address the challenges and increase the statistical power for detecting valid signals. The research will facilitate innovations in statistical theory and methodology as well as in broad applications.

For more information, please

see: [https://www.nsf.gov/awardsearch/showAward?AWD\\_ID=2113570&HistoricalAwards=false](https://www.nsf.gov/awardsearch/showAward?AWD_ID=2113570&HistoricalAwards=false)



## Euclid's Algorithm

$$a = q \cdot b + r$$

$$9 = (1)7 + 2$$

$$7 = (3)2 + 1$$

$$2 = (2)1 + 0$$

$$1 + \frac{1}{3 + \frac{1}{2}} = \frac{9}{7}$$

# Math major Ben Gobler wins Council on Undergrad Research Award at Mathfest

The [Mathematical Association of America's](#) (MAA's) annual [MathFest](#) took place August 4th-7th and many WPI faculty and students participated and gave presentations. Our very own Ben Gobler (majoring in Mathematical Sciences) gave a presentation titled "Listing the Rationals Using Continued Fractions". This presentation was awarded the Council on Undergrad Research (CUR) Award at MathFest. Congratulations, Ben!!



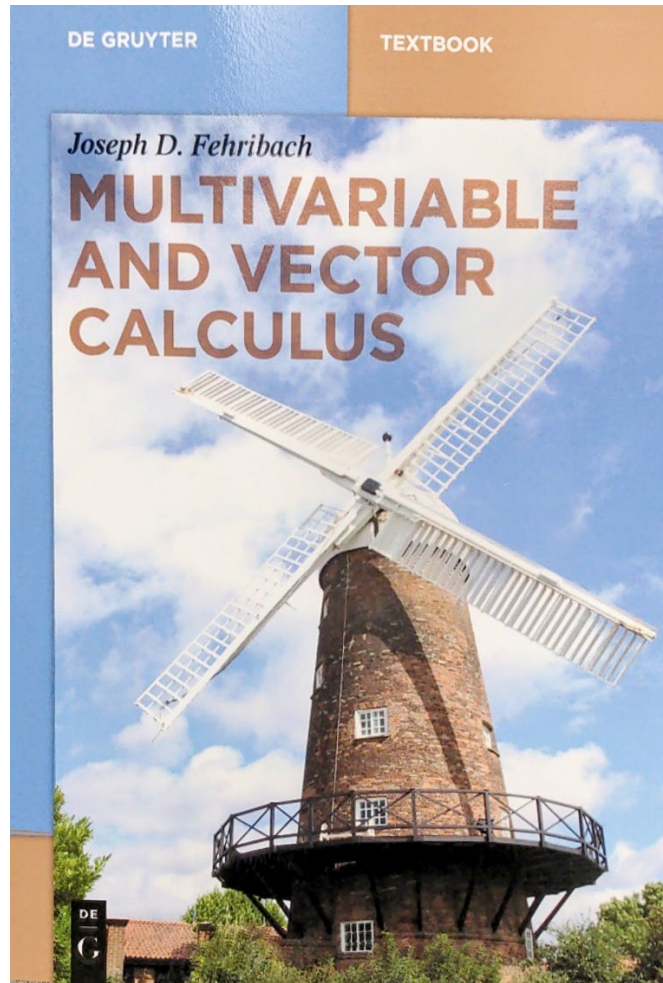
## **Vladimir Druskin awarded 3 year NSF grant.**

The 3-year NSF award is titled "Collaborative Research: Multiscale Simulations and Imaging of Viscoelastic Media in Reduced Order Model Framework" and is joint with Elena Cherkaev (University of Utah) and Murthy Guddati (NCSU). Vladimir is the PI on the WPI part of the award (\$159,552). In Vladimir's own words: The foundation of this project is the Stieltjes-Krein (elastic) network realization of data-driven reduced order models that we previously developed for imaging in oil exploration and defense applications. We plan to extend this approach to non-Stieltjes viscoelastic networks and apply it to non-destructive testing and medical imaging.

For more information, please see:

[https://www.nsf.gov/awardsearch/showAward?AWD\\_ID=2110773&HistoricalAward\\_s=false](https://www.nsf.gov/awardsearch/showAward?AWD_ID=2110773&HistoricalAward_s=false)





## Joseph Fehribach authors new textbook "Multivariable and Vector Calculus"

This carefully-designed book covers multivariable and vector calculus, and is appropriate either as a text of a one-semester course, or for self-study. It includes many worked-through exercises, with answers to all the basic computational ones and hints to those that are more involved, as well as lots of diagrams which illustrate the various theoretical concepts. It is written at the level of the WPI courses MA 1024 Y and MA 1034, and we hope that it is followed in a couple of years by a second book on sequences and series in calculus, based on the material in MA 1033. More information can be found

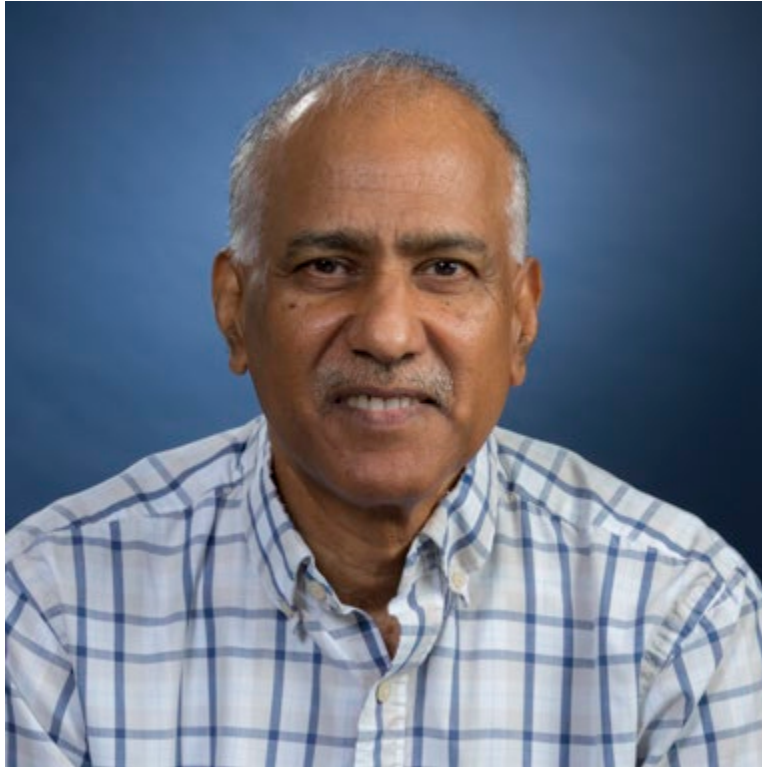
at <https://www.degruyter.com/document/doi/10.1515/9783110660609/html>

# **Math Students Put in Outstanding Performance at 2021 William Lowell Putnam Mathematical Competition**

William Aaron, Connor Anderson, Kyle Dituro, Ben Gobler, Avery Smith, and Kejia Wang participated in this prestigious mathematics competition involving students from the US and Canada.

These tests are extremely challenging-- the median score of all participants is often 0 or 1 (out of a maximum of 120). This year, over half the team broke into the double digits! Extraordinary work! WPI's top scorer this year was Ben Gobler!! Congratulations, Ben!!

In addition, many thanks to Prof. Pdraig O'Cathain and Prof. Briggite Servatius for their time and efforts training and leading this team effort.



## **Bal Nandram receives USDA NASS grant to get reliable estimates of cash rental rates**

In [Professor Nandram's](#) own words: This work at [NASS](#) is to develop Bayesian small area models to get reliable estimates of cash rental rates. I also advise researchers at NASS on the use of these small area models, which use Markov chain Monte Carlo methods extensively and routinely. NASS informs many crop insurance and agricultural support programs administered by other agencies.. Many farmers rent their lands to other farmers, and it is useful to know annually what a fair price is by practice (irrigated, non-irrigated, and pasture land) for each of 49 states consisting of nearly 3000 counties with nearly two million operations. Models must be operationalized to provide fast analysis and precise positive estimates of cash rental rates with standard errors. This is a very important on-going activity at NASS because NASS is responsible to the US government to perform this research activity.

# Kevin Stern named winner of Provost's MQP Award for Math Department

On Friday April 30th, we held our virtual project presentation day event. Eighteen projects were presented, showcasing many areas of Mathematical Sciences. This year, the projects and presentations were outstanding!

Congratulations to **Kevin Stern**, the winner of this year's Provost's MQP Award for the Department of Mathematical Sciences!

**Project Title:** *Equivalent Resistances of Polytope Networks*

**Student:** Kevin Stern

**Advisors:** Brigitte Servatius (MA), Padmanabhan Aravind (PH)

An additional congratulations to all graduating seniors along with their MQP advisors for completing this important part of what makes WPI unique.

Last but not least, a heartfelt thank you to the Undergraduate Committee--Randy Paffenroth, Jon Abraham, Joseph Fehribach, Oren Mangoubi, Fangfang Wang, and Min Wu-- and our Operations Manager Rhonda Podell for putting together this stellar event!



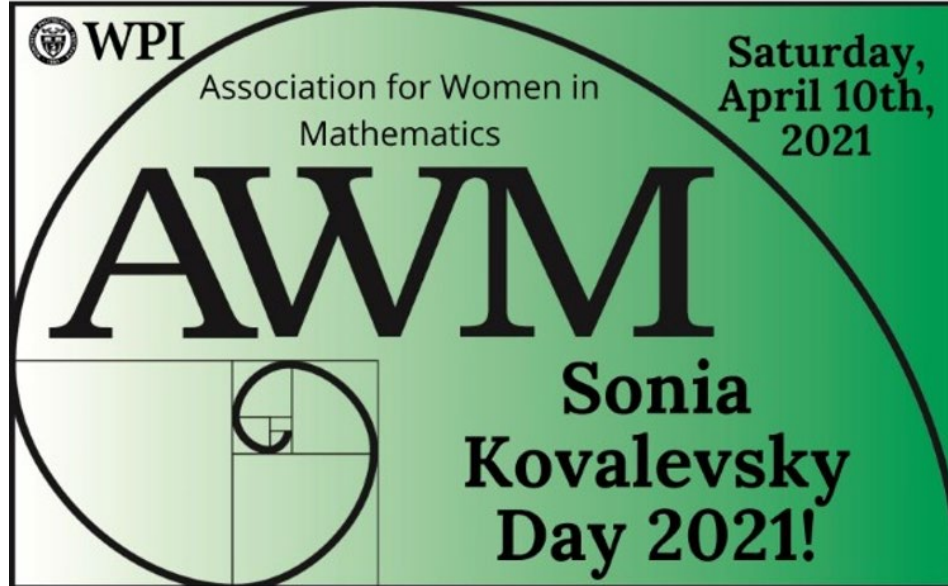
## **Adam Sales receives Grant to Use Modern Measurement Models to Summarize Complex Implementation Data**

In Adam's own words: Randomized field trials of interventions in education, health, and other areas often gather complex, rich data on how the intervention is carried out. For instance, in interventions involving educational technology, researchers gather computer log data of students' actions within the program. There is broad agreement that implementation data is important, but little guidance on how best to use it to understand treatment effects. This project develops a framework for using modern measurement models to summarize complex implementation data, and then to estimate different average treatment effects for groups of subjects who implement (or would implement) the intervention in different ways.

For further information on this award, please

visit: <https://ies.ed.gov/funding/grantsearch/details.asp?ID=4544>

Adam is also a Co-PI on two other recent grants "[Improving the Power of Education Experiments with Auxiliary Data](#)" and "[Direct adjustment in combination with robust or nonlinear regression: software and methods for RDDs, RCTs and matched observational studies](#)"



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## **WPI Math Department and WPI Student Chapter of the Association for Women in Mathematics Hosts Sonia Kovalevsky Day Event.**

Over 2 dozen 6th, 7th, and 8th grade girls with an interest in math signed on for this virtual event to honor Sonia Kovalevsky, the first woman to obtain a PhD in Mathematics. The goal of the event was to bolster participants' passion and enthusiasm for mathematics in a supportive environment. WPI students engaged the participants in math activities and featured keynote talks by women leaders in STEM including WPI President Laurie Leshin and WPI Dean of Arts and Sciences Jean King. SK Day 2021 was supported by a grant to [Prof. Andrea Arnold](#) from the Women's Impact Network as well as the WPI Mathematical Sciences Department.



## **Professor Oren Mangoubi Receives NSF/CCF Grant**

The grant is titled "CRII: AF: Optimization and sampling algorithms with provable generalization and runtime guarantees, with applications to deep learning".

*In Professor Mangoubi's own words "The aim of this project is to design novel optimization and sampling algorithms for training deep learning and other machine learning models, and to prove guarantees on the running time, generalization error, and related robustness properties of these algorithms. Training algorithms with good generalization properties can lead to machine learning models which are more robust to changes in the dataset, allow for robust predictions, and help mitigate algorithmic bias when the training dataset may not be fully representative of the diversity of the population dataset."*

For more information, please visit:

[https://www.nsf.gov/awardsearch/showAward?AWD\\_ID=210452](https://www.nsf.gov/awardsearch/showAward?AWD_ID=210452)



## **Randy Paffenroth Partners with Synoptic Engineering (Prime: DARPA)**

May 24, 2021

In this project, WPI Professor Randy Paffenroth is working with Synoptics Engineering (Prime: DARPA) on using machine learning to study electromagnetic scattering problems. The key idea is to train deep neural networks on far-field scattering patterns and use these deep neural networks to infer properties of the scattering medium.



# Congratulations to 2021 WPI Kryptos Team

Math Students Frederick (Forrest) Miller and Avery Smith turned in an excellent performance at this year's Kryptos Challenge a multi-day hacking competition hosted by Central Washington University.

The contest held on April 22nd consisted of a series of three cryptanalysis challenges, with 65 teams (over 128 students) from the USA and abroad taking part. The WPI team achieved "Babbage" level by solving two out of three of the challenges. (Just 10 teams solved all three and 11 other teams solved the first two.) Congratulations to Avery and Forrest for this wonderful achievement!!

In addition, many thanks to Prof. Bill Martin for being the faculty advisor!

# **Math Grad Student Wins 1st Place at The Finals of The Graduate Research innovation Exchange (GRIE) held in April**

Congratulations to Yang (Lyric) Liu! She won 1st place in the Mathematical, Chemical, and Physical Sciences for her poster presentation on "Bayesian Inference for Big Data: Combining Probability Sample and Non-probability".

Congratulations to her faculty advisor as well, Prof. Bal Nandram!



## Math Students Take Top Prize in Actuarial Case Competition

Congratulations first year MAC majors, Celeste Rehm, Abby Barksdale, Kevin McGonigle, Emerald Pham, and Anshika Jain and Liz Cole for winning the 13th Annual Actuarial Case Competition sponsored by Travelers Insurance!!! <https://www.wpi.edu/news/announcements/wpi-students-take-top-prize-actuarial-case-competition>