VOLUME XIII, NO. I MAY 2023

VECTORS

The Newsletter of the Rowan University Mathematics Department

NEW MEMBERS INDUCTED INTO PI MU EPSILON

The Mathematics Department inducted 24 students into the New Jersey Xi Chapter of Pi Mu Epsilon (PME) this spring. Pi Mu Epsilon is a national mathematics honor society that is dedicated to promoting mathematics and recognizing students who successfully pursue mathematical understanding. The Mathematics Department held an induction ceremony for the new members in April. Dr. Uma Thayasivam (Mathematics Department Chair), Jen Hoxworth (PME advisor), Tina Fellona (Mathematics Department Principal Clerk/Typist), and Rachal Bruno (a previous PME inductee) hosted the event. Families and friends of the inductees also attended the ceremony.

The new inductees include: Brett Boyle, Hannah Corbin, Carly Dougherty, Lauren Eckert, Vincent Fedoryka, Sandra Garneau, Arielle Gsell, Evan Harper, Alexander Herrman, Madison Hicks, Tabinda Kashif, Robert Kerwin, Kui Kim, Kayla Paige King, Jordan Malgapo, Isabella Marshall, Michael McGuckin, Valerie Molinari, William Nagie, Hoang Huy Nguyen, Samarth Patel, Gianna Riviello, Rachel Roche, and Sarah Zorn.

Pi Mu Epsilon membership qualifications include:

1) Undergraduate students who have completed at least the equivalent of two semesters of calculus and two additional courses in mathematics, at or above the calculus level, all of which lead to the fulfillment of the requirements for a major in the mathematical sciences. In addition, such students must have maintained a grade point average equivalent to that of at least 3.0 on a 4 point scale, both for all courses that lead to fulfillment of requirements for a major in the mathematical sciences, and also for all courses that lead to fulfillment of requirements for an undergraduate degree.

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NEW MEMBERS INDUCTED INTO PI MU EPSILON, *Continued from page 1*

2) Graduate students whose mathematical work is at least equivalent to that required of qualified undergraduates, and who have maintained at least a B average in mathematics during their last school year prior to their election.
3) Members of the faculty in mathematics or related subjects.
4) Any persons who have achieved distinction in a mathematical science.

To learn more about PME, visit http://pme-math.org/ or contact the advisor Jen Hoxworth at hoxworth@rowan.edu

ASSOCIATION FOR WOMEN IN MATHEMATICS

The student chapter of the Association for Women in Mathematics (AWM) at Rowan seeks to build a safe space and tight community of students and faculty who enjoy mathematics and support women and non-binary persons pursuing STEM related careers. Although they are not yet an official Rowan club, the students are working hard towards it! The current chapter organizers are Bella Stefanowicz, Jackie Regensburger, Carly Dougherty, Soorya Baliga, and Jessica Rippman. The advisors are professors Shannon Miller and Benjamin Nassau. Different club activities have included game/movie nights, study sessions, pet therapy, Saxbys coffee and breakfast run, and more!

THE MATHEMATICS DEPARTMENT HELD THEIR ANNUAL "THANK YOU" PICNIC

The Mathematics Department held their annual "Thank You" picnic at Washington Lake Park. Many students were recognized for their service to the Mathematics Department (see list below). Students who completed research, competed in mathematics competitions, served as a peer mentor, tutored, served on the Math Team, and so force received certificates of achievement. Faculty and staff were also acknowledged. Paula Pilitowski was recognized for her devotion and service to the Mathematics Department. Dr. Marcus Wright and Dr. Thomas Osler were recognized for their dedication and many years of teaching at Rowan University. (A tribute to Dr. Osler is planned for the upcoming edition of *Vectors*.) Family, friends, and alumni attended the picnic as well. There was plenty of food and fun for all!

Students recongized:

Gianluca Barone
Soorya Baliga
Ian Branin
Rachel Bruno
Liam Busch
Felix Hakmi
Nico Kaegi
Aayuch Kapri
Brittany Lazzaro
Jennifer Leach
Mary Lisicki
Molly Lodge
Isabella Marshall
Brandon McHenry
Dominick Profico
Iosefa Sunia
Anthony Thompson
Luke Tonon
James Turbett
Ronald Yang
Harper Zappone

CONGRATS TO THE STUDENT AWARD RECIPIENTS

The Mathematics Department recognized their top students with prestigious Rowan University awards.

- *Dean's Outstanding Senior* was awarded to **Liam Busch**
- *James M. Shafer Medallion* was awarded to **Michael Lombardo**
- *Frances Fiorato Fithian Legacy Scholarship* was awarded to **Arabella Stefanowicz**
- *John Sooy Scholarship* was awarded to **Rachel Bruno**
- *Outstanding Junior in Math* was awarded to **Ryan Correll**

a SEA of MATHEMATICS

Learn how Dr. Helga Huntley combines mathematics and oceanography.

As an applied mathematician, **Dr. Helga Huntley** has long been collaborating with physical scientists to unveil the secrets of how the ocean and atmosphere work. Now, thanks to funding from NASA, she is exploring what these physical insights can tell us about animal behavior.

The project is entitled "The Size, Trophic and Spatial-Temporal Scaling of Environmental Selection in Pelagic Species", which is a bit of a mouthful – and what in the world is "trophic scaling"? Thankfully, Dr. Huntley's collaborators this time are biological oceanographers Drs. Matt Oliver, Aaron Carlisle, and Jerome Pinti from the University of Delaware, who know what all that jargon means and, more importantly, why it matters. So, what are they getting at?

"Pelagic species" are animals that dwell in the open ocean, including, of course, many fish species, sea turtles, and marine mammals like whales. The question the team is trying to address is how these critters choose where to hang out. This is important for understanding ecosystems and how adaptable they are to changing environmental conditions. Most likely, the answer has something to do with food availability: predators go where the prey is. But if you are the type of fish that travels slowly and needs a lot of energy to get from one place to another, chasing a big school of prey may not be in your best interest, and you may choose to frequent places where prey isn't necessarily that densely concentrated but is reliably available. So, how pelagic species travel is hypothesized to depend on their size. And on their trophic level.

The "trophic level" describes where a species is in the food web, the higher the trophic level, the higher up in the food chain. For land animals, think wolf (high trophic level) versus deer (low trophic level). In the ocean, sharks and orcas are near the top, with zooplankton near the bottom. At the bottom of the food chain, critters tend to be grazing, consuming lots of small meals, whereas animals at the top tend to have fewer, larger meals. That can impact how they think about expending energy to fill their bellies.

So, what does all this have to do with math? Lots. Math allows the researchers to take observations from NASA's satellites – which are mostly in the form of intensities of various electromagnetic waves – and convert them into something interesting, like ocean surface temperature or the densit of chlorophyll, which is a proxy for the availability of plants for those grazers at the bottom of the food chain. Math also lets us model the parts of the ocean that cannot be directly observed, filling the holes between available measurements. Math provides the theory for tracking how uncertainties in measurements turn into uncertainties in the quantities we actually care about.

And that's just the beginning. For this project, Dr. Huntley and her colleagues are determining whether various pelagic animals that have been outfitted with GPS trackers tend to spend more time in parts of the ocean that are distinguished in some way, either by being warmer or cooler, by having a higher rate of production of those plants

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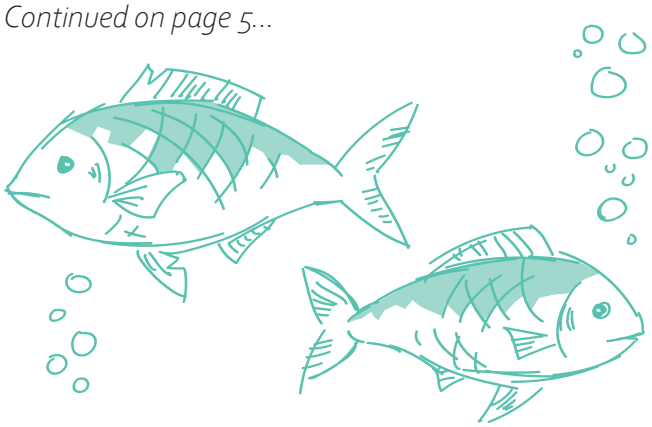


A Sea of Mathematics, *Continued from page 4*

at the bottom of the food chain, or by having currents that tend to accumulate floating stuff (like not very mobile food: plants and small creatures). That requires more math to distinguish places where the animals could have gone but didn't, to turn ocean currents into a patchwork of accumulation regions and gaps between them, and to quantify associations – how likely the presence of an animal is associated with a physical property of that location in the ocean. With all those calculations, the team will be able to answer the question whether temperature, chlorophyll, and accumulation regions impact animal trajectories, for what species these properties matter, and at what scales.

ROWAN UNIVERSITY CHESS CLUB

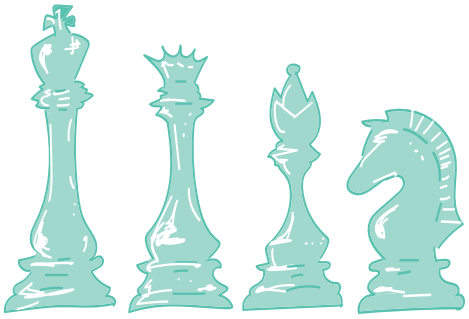
Professor **Ira Fine** continues to lead Rowan University's Chess Club! This semester, the Rowan Chess Club had their spring quads and they raised $200 for brain cancer research.

The Rowan Chess Club also hosted an event in conjunction with the South Jersey Innovation Center. The event consisted of Grandmaster Alex Lenderman playing against 36 people simultaneously! Lenderman is one of the best chess players in the nation and has been ranked in the top 100 players in the world. Excitingly, Professor **Rade Musulin** of the Mathematics Department got a draw against Lenderman during the event!

If you are interested in joining the Rowan Chess Club, please contact Professor Ira Fine at fine@rowan.edu

Professor Musulin planning his move while GM Lenderman makes his rounds.

Spring Quads



ADJUNCT INSTRUCTORS' CORNER

The Mathematics Department is home to many talented adjunct instructors and this space is dedicated to them! Learn more about instructor Michelle Keating in this issue of *Vectors*.

This is instructor **Michelle Keating's** 40th year of teaching Mathematics! She taught high school mathematics for 38 years. She was the Math/Science Chairperson and STEM Academy Chairperson at Glassboro High School. She's been teaching at Rowan University since 2016 and brings a wealth of knowledge to her students. Her BA is from LaSalle University (1983) and her MA is from Rowan University (2005). Instructor Keating has earned the following awards:

- NJ Golden Apple Teaching Award
- Rowan University's Medallion Award
- Most Influential Teacher Award
- Who's Who Among America's Teachers
- Preston & Steve's Coolest Teacher (WMMR)

Teaching is her PASSION! And it shows. On a personal note, instructor Keating has a wonderful husband, three amazing daughters, and a loving goldendoodle. In her free time, she enjoys gardening and mentoring young people.

ROWAN'S ACCEPTED STUDENTS DAY

The Mathematics Department welcomed new students during Rowan University's Accepted Students Day. Professors **Benjamin Nassau** and **Jen Hoxworth** along with some of the Math Team members were in attendance to meet the new students and help give out t-shirts. The new students and their families received lots of information while participating in fun activities.

STUDENT SPOTLIGHT: Liam Busch

Graduating mathematics student, **Liam Busch**, shares his experience at Rowan University!

I am proud of what I have accomplished in my years here at Rowan University. After four years of tutoring, three years of research, and two years of leading the Math Team, I am satisfied with my work here at Rowan University. It's a bittersweet moment, for certain. While I certainly feel ready to move on to the next stage of my life, I know that I will be leaving a lot behind. I've made many friends here at Rowan, and I will be far away from them all as I move for graduate school. I would like to urge my fellow students to enjoy their time here at Rowan as much as they can. You don't know how much you'll miss it.

During his time at Rowan, Liam participated in different mathematics competitions.

I participated in the Putnam Competition twice. In both years that I participated, I also helped run some of the practice sessions. It was a wonderful experience being able to practice for the competition with other intelligent and passionate students. It was also a lot of fun to be able to discuss our solutions with each other after the competition. Last year I also participated in the mathematics competition at the Garden State Undergraduate Mathematics Conference. It was held virtually, so I sadly was not able to properly meet the other students that I was on a team with, but it was a lot of fun to spend the afternoon attempting challenging math problems from home.

Liam also participated in different research opportunities.

I spent two years doing research with Dr. Hieu Nguyen searching for an efficient algorithm that decoded corruptions of binary

codewords. In the end, we were able to find such an algorithm, and it was very satisfying being able to present my findings at JMM and the Garden State Undergraduate Mathematics Conference. The experience that I had with the project was one of the best that I have had at Rowan. It helped inspire me to apply to summer research experiences for undergraduates (REUs), and I was accepted into one this past summer at Florida International University, where I worked with two other undergraduates and one graduate student on a graph theory project, which will hopefully be fully published by next year. Upon my return to campus the following fall, I joined a project with Dr. Abdul Hassen investigating the calculation and properties of more generalized Euler numbers as part of my Mathematics Research course. All of my research projects have been highlights of my undergraduate career, and I encourage all my fellow students to ask their professors if they have any opportunities for them.

FACULTY SPOTLIGHT:

Benjamin Daniels

Benjamin Daniels is a senior lecturer for the Mathematics Department. Read on to learn more about this dedicated professor!

I am from the middle of nowhere in Cumberland County, NJ and live in nearby Gloucester Township. I have been at Rowan University in some capacity for the last 16 years. I have taken undergraduate and graduate classes here, I oversaw the math tutoring program for two years, and for the last eight years, I have taught courses for the Mathematics Department.

I teach mostly first- and second-year undergraduate math and stat courses. I wear many hats around the university, but my two biggest contributions are overseeing the development of curriculum in the Mathematics Department and the Rowan Core and Experience courses across the whole university. Exciting news in those arenas include a new undergraduate degree in data science and a refocusing of student support and engagement through the development of a University College.

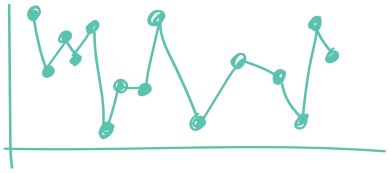
Most of my time is spent making sure that I am delivering content that is accessible and useful to the students in my courses. I had a bumpy start to my academic career, and it was not until late in the game that I decided to become a teacher. I wanted to give back and help students learn and develop the way that I was given the chance to by my mentors. Often, students think of learning as a passive process. I am a firm believer in active learning and strive to engage my students with the material in the classroom instead of just lecturing to them about it.

I have been, until recently, the primary faculty advisor for the Rowan Math Team. The Math Team serves as both a social club for students as well as a source of tutors for the Mathematics Department's tutoring program. Some of them also participate in regional and national mathematics competitions. Let me know if you think you might be interested in joining. All are welcome. You do not have to be a math whiz kid.

Rowan Professor Strives to Improve High School Mathematics

Dr. **Eric Milou** is determined to improve high school mathematics. The general structure of high school mathematics has essentially remained unchanged for close to a century and the out-of-date mathematics curricula are failing many students. Dr. Milou recently published Invigorating High School Math with Steven Leinwand. This book addresses the most crucial challenges in high school mathematics and provides practical advice on a variety of important topics. Invigorating High School Math is written for high school mathematics educators and leaders and it stimulates discussion and provides a map for change.

ROWAN PROFESSOR STUDIES THE IMPACT OF COVID-19 ON STOCK MARKET RETURNS



Dr. **Subhashis Nandy**, a mathematics faculty member at Rowan, presented at the New Jersey Big Data Alliance (NJBDA) on "An Empirical Study on the Stock Market Returns of Five Developing Countries and the United States from the start of COVID-19 Through December 2021." The purpose of his research study was to determine whether the stock market indices of five developing countries (Hong Kong, India, Brazil, Russia, and Mexico) and the USA have been equal from January 2020 to the end of December 2021.

MATH TEAM ANNOUNCEMENTS

From the Club President

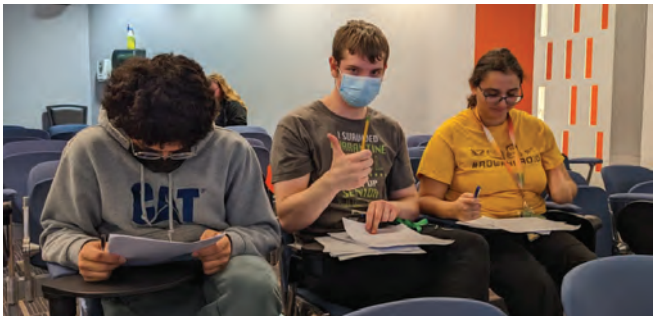
This semester the Math Team held monthly meetings, volunteered at Accepted Students Day, attended the Garden State Undergraduate Mathematics Conference, participated in the NJ Undergraduate Mathematics Competition, collaborated with the Rowan Gaming Club, and collaborated with the Rowan Progressives.

Math Team members attended the Garden State Undergraduate Mathematics conference held at Kean University this spring. We listened to different talks and went to the poster session. Math Team members also competed in the NJ Undergraduate Mathematics Competition (photos on right) which had an individual and a team component to the competition.

The Math Team collaborated with the Gaming Club this spring to host a presentation in which we showed that Magic: the Gathering, a trading card game, is Turing complete! We went through the entire set-up of a turing machine using the game state, and then we went through an entire loop, which would represent a clock cycle in a computer. We used Magic: the Gathering to show what it means to be Turing complete in a fun way!

The Math Team also collaborated with the Rowan Progressives. We hosted a presentation to discuss how political groups misrepresent data to create false narratives. We explored an introduction to statistical literacy and used real examples of misconstrued data to show not only how often statistics come up in the news cycle, but also how important it is to understand the otherwise subtle modifications that can completely change what a data set appears to be showing.

Liam Busch, Math Team President



CURRENT SPRING SEMESTER OFFICERS

Liam Busch (President)
Jacob Levey (Vice President)
Brittany Lazzaro (Secretary)
Rachel Bruno (Treasurer)
Grace Huang (SGA Senator)

WHO TO CONTACT IN THE MATHEMATICS DEPARTMENT

Students, make sure you are meeting with the Mathematics Advisor!.

Cristine Mason, Mathematics Advisor (masonc@rowan.edu)
Advising is a vital part of your academic progress and success in the mathematics program. Advisor Mason urges you to communicate with her and visit her on a regular basis to make sure you are meeting all of your program requirements. She is always happy to help:

- Review the program guide and requirements for your major (located at https://sites.rowan.edu/registrar/program-guide-info/guides-science.html)
- Go over your courses and discuss the remainder of your program coursework
- Select coursework for the upcoming semester or make a plan for all remaining semesters and courses
- Answer any questions you have about your program

Students, not sure who else to contact? Check out this list:

Dr. **Christopher Simons**, Associate Chair (simons@rowan.edu) – Contact him when you have a concern regarding an adjunct faculty member.

Dr. **Abdul Hassen**, Student Affairs Coordinator (hassen@rowan.edu) – Contact him when you need to take a course for the third time or when you have a grade dispute that needs to be mediated.

Dr. **Nasrine Bendjilali**, Graduate Program Coordinator (bendjilali@rowan.edu) – Contact her when you have questions regarding the graduate programs in mathematics.

Dr. **Ik Jae Lee**, Course Transcript, Placement, and Program Evaluator (leei@rowan.edu) – Contact him when you have a prerequisite issue with a mathematics course or if you are a transfer student in mathematics.

PHOTO CREDITS

A special thanks to those who submitted photos for this issue of *Vectors*: Liam Busch, Benjamin Daniels, Tina Fellona, Ira Fine, Jen Hoxworth, Michelle Keating, Eric Milou, Sara Ramick, and Bella Stefanowicz.

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MESSAGE FROM THE EDITOR

Hello! As always if you have a story to share in a future edition of Vectors, please let me know! Information and photos can be submitted here:

https://forms.gle/STUGDLyR2KcepkqNA

If you are interested in subscribing to Vectors, let me know here:

https://forms.gle/bJ5XVxdJQ2L1TP5H7

Thanks for reading!

Jen Hoxworth
hoxworth@rowan.edu