MATHEM@TICS

This issue is dedicated to our graduating majors and minors in mathematics and in data science. Many of them have written for this newsletter memories of their studies at IC and plans for the future.

Congratulations, graduates! We are grateful for the time we have had together and the imprints you have left on us and our department over your time here.

ν_0: From the Desk of the Chair

Though our years are numbered and the numbers 2022 and 2023 are not prime, 2022–23 was a prime year for the current and former students and faculty in the math department. The end of the pandemic provided us new hope along with the opportunity and energy to resume all of our outreach and awards programs. We celebrated student accomplishments with a return of the Fall Awards Reception and the spring Pi Mu Epsilon Induction Ceremony. Faculty, students, and alumni brought math to young people at the Community Math Day, IC Women in Math Day, and Math Exploration Day events. Students competed in math competitions, attended and presented at conferences and our colloquium series, and enjoyed working and collaborating in the updated math student lounge.

Students, alumni, faculty, and former faculty participated in so many of our programs in 2022–23 and made them successful, and we are grateful! Read on to learn more about our future alumni and the contributions of our current alumni to our vibrant community.

To our graduating seniors and current alumni, know that you are always welcome to circle back to South Hill to add the uniqueness of your existence to this unbounded and real set(ting). Best wishes for a radical summer,

Ted Galanthay, interim chair

ν_1: Hats off to our Graduates

Michael Avanessian is graduating with a Bachelor of Music with an Outside Field with a major instrument of percussion and an outside field of mathematics, plus an Honors minor. He's having a hard time thinking of one specific memory of math at IC, but he does have fond memories of Abstract Algebra: he appreciates the course not just for the fun of working with complex numbers and modular arithmetic and other groups, but also for getting him more comfortable with an area of math that had previously given him trepidation: proofs. Next year, Michael will begin a Master of Music in Contemporary Classical Music at Boston Conservatory (playing percussion, of course), but he anticipates that math will continue to be important in his life.

Matt Beyer is a double major in Accounting and Business Administration (concentration Asset Management). He also has two minors in Data Science and Business Analytics. While completing his Data Science minor, Matt was able to learn about a ton of different math topics through the classes that the department offers, his favorite being Calculus III and Linear Algebra. In Linear Algebra, Matt got the chance to analyze NBA data and utilize data science techniques he learned in class to generate accurate, comprehensive projections for different player statistics like points scored in a game, winning percentage and total salary. Projects that involve real world applications like this are what made Matt's experience so special.

Calvin Carmichael is a Senior Finance Major with minors in Mathematics and Data Science from Sudbury, Massachusetts. One of his favorite memories at IC was learning about the intricacies of option pricing in financial markets. The five Greeks: Delta, Gamma, Theta, Vega, and Rho (which are used to price options) brought together skills he learned in his Calculus and Differential Equations classes and showed how applicable those classes are to the financial services industry he will be working in. Though this class was in the Business School, he was able to gain a deeper understanding of the Black Scholes option pricing model through connecting with professors in the math department. Calvin hopes to continue learning mathematics after graduation on his job at Virtu Financial and potentially in graduate school.

Mateo Hernandez is a Computer Science major and Data Science minor from New York, NY. One of his good memories at IC was working on the final project for Data Science with R where he attempted to learn the determining factor of how a state votes in the Presidential Election. In the end, he found that no single variable could accurately predict how a state would vote, however, he enjoyed the challenge and was appreciative of the help from his professor. In the coming years he hopes to work as either a software engineer or data scientist and possibly wants to go to graduate school after a year or two.

Martha Kemp-Neilson is a senior Mathematics major with a double minor in Data Science and Economics, from New Rochelle, NY. One of her favorite memories at IC was helping at Math Exploration Day. This year she helped Professor Megan Martinez whose station included Islamic Geometric Design. She got to explore the intersection between math and art and inspire the high school students that math is fun! In the coming years, Martha hopes to work in Data Science or Cybersecurity.

Alex Kennedy is a Writing for Film, Television, and Emerging Media major with a minor in Mathematics. One of her favorite memories involves a study group working on a homework problem that didn't seem to have a clear answer. The group spent all day trying to figure out how to answer the question with no solution in sight. That night, Alex woke up with a startling revelation on how to solve the problem. The next day, the study group worked together to prove their answer. The persistence and group work motivated Alex to work with other people and take time to search out answers, even if it takes an extra week of your time :)

Brendan Lackey is a Business Administration major with a concentration in Finance, and a Mathematics minor. He is from Maplewood, NJ, and has grown to love the city of Ithaca. One of his favorite memories of IC was his final project for Math Experimentation, which focused on game theory relating to Mario Cart. Brendan and his group may have spent more time "researching" the game than was necessary for the project.

Kurt Mannick is a Business Administration major with a minor in Data Science from Newtown, Pennsylvania. One of his favorite memories at IC was when he created an animation to show the geometric interpretation for the loss function of a Linear Regression model for his Machine Learning class. Kurt was able to explain how the complex model worked to his family who were not familiar with the concepts, and he is quoted as saying: "I didn't realize how much I enjoy teaching other people. I'm glad I found a new passion that I'll take with me into my professional career."

Katy Krueger is an Exercise Science major with a Data Science minor from Syracuse, NY. One memory she has from IC was discovering her high school calculus teacher's picture being in the A&E. Speaking with him again encouraged her to re-engage in the subject and get a math minor, which later became a data science minor. This has helped shape her plans for next year, where she will attend graduate school at Marquette University studying Sport and Exercise Analytics.

Drew McGee is graduating with a Mathematics and Physics dual-degree, focusing specifically in theoretical astrophysics. They are originally from Philadelphia, PA. They will really remember their time at IC as endlessly influential, the skills and lessons learned will last them a lifetime. They plan on continuing their education, going for a PhD in astrophysics. However, they plan on taking a gap year immediately following graduation. They want to go backpacking, earn some money before grad school, and take some time to generally enjoy life! Drew's favorite memory from IC was returning to classes after COVID. They'll never forget the first class they had in person, following almost a year of online instruction.

Angelica Otero is a senior Accounting major with minors in both Mathematics and Business Analytics from Rochester, NY. One of her good memories at IC

was participating in Professor Weinberg's textbook study to observe how students read a textbook and solve problems based on a reading. She enjoyed being able to add value to the study and the challenge it was for her memory to recall certain Calculus concepts. After graduation, Angelica plans to return for her master's Accounting program at IC to obtain her CPA license.

Austin Ruffino is a Business Administration major with minors in Data Science, Economics, and Business Analytics. Some of his favorite memories of mathematics at Ithaca College are gathering datapoints to import into ArcGIS for his class on spatial data analysis, and tutoring students in Applied Calculus for over three years. His favorite mathematical theorem is the law of large numbers. Austin would like to thank Professors Tom Pfaff and Pete Maceli for their support in his mathematical journey. Next year, Austin will be travelling to France to work as an English Teaching Assistant at the secondary school level.

Evan Turkon is a B.S. Mathematics major with an Economics minor and a native to the Ithaca area. Evan's interest in math is a recent endeavor. He transferred to IC from SUNY ESF in his second semester of undergrad. After taking an intro to College algebra class at ESF in which he received a D, he never expected majoring in math was a possibility. Three and a half years later, he is on his way to a career in data science. Evan has been accepted to the University of San Francisco to pursue a master's in data science (MSDS) and is excited to continue to apply much of what he learned at IC in his studies.

Sara Wright is a graduating with a Bachelor of Science in Biology with minors in mathematics and chemistry. Her favorite memory with the mathematics department was when she was taking World of Math with Dave Brown. This course allowed the students to explore the variety of math topics with multiple department members in fun ways. She really enjoyed building the marshmallow and toothpick fractals. She would like to thank the math department for always encouraging her to explore and take new courses and reintroducing her to her love of math.

Emmett Barry, Computer Science major, Data Science minor

Daia Bromberg, Mathematics major

Noel Foster, Business Administration major, Data Science minor

Kyle Lambert, Business Administration major, Data Science minor

Elliot Mintz, Mathematics major, Education Studies and Philosophy minors

Ted Mburu, Applied Physics major, Math and Computer Science minors

Matthew Naveran, Accounting major, Math and Business Analytics minors

Sara Ostermeier, Music major, Math minor

Gray Valli, Mathematics major

Theresa Volk, Clinical Health Studies major, Math minor

ν_2: **Math in the News**

A few recent articles about math in the news.

Scientific American: Newfound Mathematical 'Einstein' Shape Creates a Never-Repeating Pattern

The Guardian: US teens say they have new proof for 2,000-year-old mathematical theorem

New York Times: The Wondrous Connections Between Mathematics and Literature

ν_3: Math Department Events 2022-23

Community Math Day

Community Math Day was back this fall! After a few years' hiatus, Williams Hall welcomed back children grades k-5 and their families, to explore mathematics through games, puzzles, music, art, and more. Math department faculty and students, as well as department friends from around campus and the community, helped make the event a success. (Special thanks to co-organizer and IC alum **April Leithner**, who co-organized the event.)

—Emilie Wiesner

Math Exploration Day

Math faculty and student volunteers shared their love of math with over 170 sophomores, juniors, and their 22 high school teachers from 17 schools at the 17th annual Math Exploration Day on March 30. Alumna **Daia Bromberg '22**, pictured, helped with Professor Teresa Moore's mini-session on geometric balloon bending, and current high school math teachers including **Savanna Scott '21, '22** and **Luke Tonjes '12** participated with their students. Professors **Osman Yürekli** and **Jim Conklin** gave presentations on The Secrets of Egyptian Numbers and Mathematical Game Theory, respectively, whereas other faculty graded

the competition exams and hosted math demonstrations.

—Ted Galanthay

Fall Awards Ceremony

On November 14, 2022, the department recognized 26 students who had excelled in mathematics as evidenced either by their cumulative math GPA or by their improvement in their math GPA. Prior to the awards ceremony, students **Tommy Angel**, **Martha Kemp-Neilson**, **Ted Mburu**, and **Earth Sonrod** shared stories about their summer math experiences that included a research experience in billiard dynamics, an internship, a physics project in data analysis, and an international conference presentation of research mentored by Professor **Osman Yürekli**.

—Ted Galanthay

Math Competitions

We had a successful year of participation in national mathematics competitions. In December **Earth Sonrod** submitted work on several problems in the annual Putnam competition. During four days in February, **Suryash Malviya**, **Samuel Smith**, and **Earth Sonrod** worked together to create and analyze a mathematical model in the COMAP competition to predict how a plant community would be affected by increasingly cyclic weather. We are looking forward to getting even more participants next year – stay tuned to a future newsletter for details.

—Jim Conklin

IC Women in Math Day
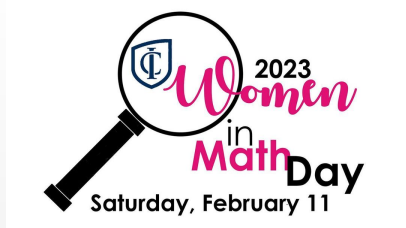
On Saturday, February 11, female high school students attended the 6th Annual IC Women in Math Day on Zoom. Current math majors **Lenley Aikin**, **Maddie Donaghy-Robinson**, and **Martha Kemp-Neilson** shared their personal experiences of studying mathematics at Ithaca College. Alumni **Jennifer Fleck '92**, **Kimberly Newman '19**, and **Joan Mattle '22** joined **Hadassah Mativetsky** on a career panel where participants learned what it's like to apply mathematical thinking in a variety of jobs and careers. Professor **Emilie Wiesner** emceed and Professor **Ted Galanthay** organized the event.

—Ted Galanthay

Whalen Symposium
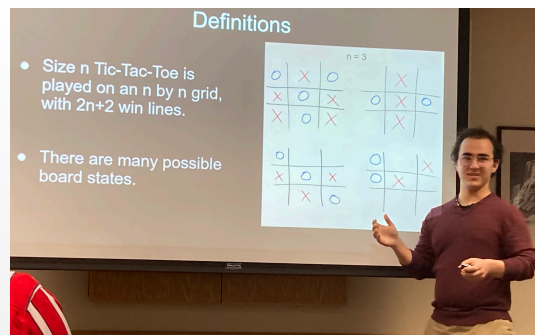
Students **Jay Barrett** ("Determining the Probability of Each Player Winning a Chutes and Ladders-esque Game"), **James Belov** ("Random Tic-Tac-Toe"), **Madolyn Donaghy-Robinson** ("Bead Crochet Patterns and Hockey Stick Translations"), and **Earth Sonrod** ("On the Fractional Value
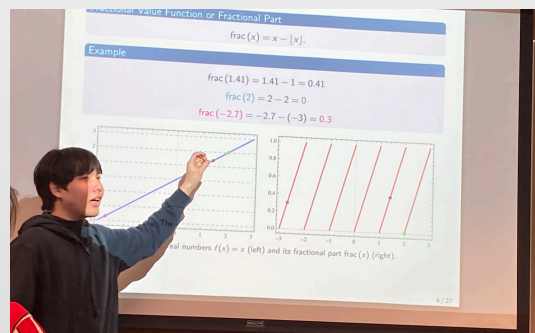

Function") presented their research at the Whalen Symposium in April. Congratulations to all four students on their interesting work and their well-received presentations.

—Emilie Wiesner

Pi Mu Epsilon Induction

The math department inducted twenty students into the Ithaca College Upsilon Chapter of the Pi Mu Epsilon math society on Monday, April 17. Alumnus and professor **Scott Wilson '00** delivered the keynote address entitled "Contemplating X-squared equals -1 where X is a square matrix, and the interesting structures that ensue." Professor **Osman Yürekli**, the chapter advisor, coordinated and emceed the event.

—Ted Galanthay
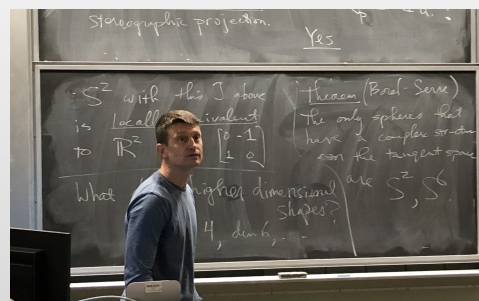
Colloquium Series

During the 2022–23 academic year, the mathematics department held a colloquium series featuring a wide range of topics and speakers and drawing students and faculty from the math department and beyond. In the fall semester we heard from **Kathryn Mann** (Cornell University) on beautiful dynamical systems that exhibit local chaos but global stability, **Ted Galanthay** (Ithaca College) on life lessons from the differential equation $dP/dt = 2P$, and several IC students—**Martha Kemp-Neilson**, **Ted Mburu**, **Earth Sonrod**, and **Tommy Angel**—who shared their summer math experiences. In the spring, **Jennifer Mann** (University of Texas) presented on the topology of DNA, **Shianne Osterreich** (Ithaca College) talked about using data analysis to promote equity in economics, **Matt Thomas** (Cornell University) discussed determining causality in observational studies, **Erin Tripp** (US Air Force Research Lab) presented on vulnerabilities in machine learning, **Scott Wilson** (Queens College) discussed complex structures using linear algebra and calculus, and **Jerome Fung** (Ithaca College) applied differential equations and linear algebra to solve light scattering problems in physics.
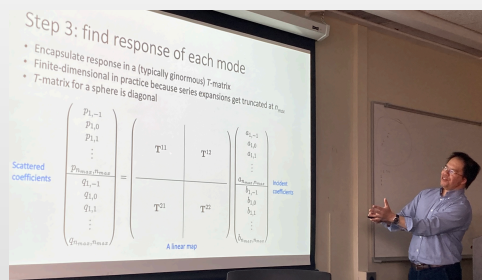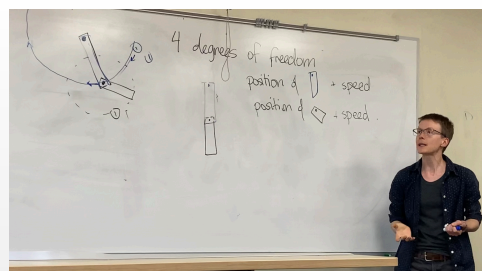
—Joash Geteregechi

Math Club

This semester, the Ithaca College Math Club continued its efforts to engage with the community. A presentation at Lehman Alternative Community School, headed by Professor **Osman Yürekli** and students **James Belov**, **Vishay Manoo**, **Lilly Johnson**, and **Sarah Wrzos**, inspired local students to explore the wonders of mathematics. The club also arranged various activities such as movie night, game night, and a pizza night that was soon to take place at Williams Hall, with the aim of promoting recreational mathematics on campus.

—James Belov

Trajectory of a Student Publication

In the fall of 2021, **Earth Sonrod**, a Math Major, collaborated with **Kate Tanner**, a Biology Major, and **Colin Leyner**, an Exploratory Major, to create a research article that was subsequently published in the Fibonacci Quarterly. This article was based on their final project in the Number Theory course, taught by **Osman Yürekli**. During the Spring 2022 semester, Earth participated in the Undergraduate Research Experience Course, which was co-taught by **Megan Martinez** and Osman Yürekli. During this time, he continued to work on the project, refining and improving it using feedback received from conference organizers and his faculty advisor at the 20th International Conference on Fibonacci Numbers and Their Applications held at the University of Sarajevo from July 25-29, 2022. In the spring of 2022, Earth presented the initial version of the article at the Whalen Symposium, and later in the fall of the same year at the Seaway Section Meeting of the Mathematical Association of America held at Siena College. After continuing to refine his work in the fall of 2022, the article was eventually accepted for publication in the Fibonacci Quarterly, Volume 60, pp. 372-383, in December 2022. The article can be accessed at https://www.fq.math.ca/60-5.html.

—Osman Yürekli

REU in Dynamical Systems

The math department hosted another summer REU in dynamical systems in June and July of 2022, with research mentors **Dave Brown**, **Ted Galanthay**, and **Dan Visscher**. The program hosted nine students from across the country, including current IC student **Tommy Angel**, who worked on projects in lattice models of ecological dynamics, billiard dynamics on surfaces of revolution, and pruned fractal trees. Students presented their work to the community at the end of the program in Williams Hall, and two groups presented their work at the Joint Math Meetings in Boston in January.

—Dan Visscher

The Mathematics Endowment

April 25 was Ithaca College giving day. We raised $7900 with 15 donors for the math endowment. The donations from math alumni, faculty, and friends to our endowment was noticed by administration as we were over represented in donors and dollars to the School of Humanities and Sciences. The department thanks you for supporting future students with this endowment and appreciate how your support reflects positively on us. We'll provide an full update and donor list in the first newsletter of Fall 2023.

—Tom Pfaff

...get more department news and photos at:

in Ithaca College Mathematics Alumni and Friends

ic_math

ν_4: What's the Problem... with Professor Brown

Given any real number a_0, define the sequence $a_{n+1} = \dfrac{2a_n^3 - a_n^2 - 7}{3a_n^2 - 2a_n - 7}$.

Determine if this sequence converges, and if so, find the exact value of the limit. A good answer will consider all a_0. A great answer will explain the good answer.

Send complete answers to Professor Brown at `dabrown@ithaca.edu`. Those submitting correct answers will have their names printed in the following newsletter. People who correctly solve all problems from Volume 4 of the newsletter will receive a special prize at the end of the year.

Solution to Prof. Brown's previous problem:

Let v be the number of vanilla sundaes sold last week and c be the number of chocolate sundaes sold last week. First, use the total for the current week to determine a relationship between v and c.

$$1.1v + 1.1c = 1.1(v + c) = 1.2v + 1.05c \implies 0.1v = 0.05c \implies c = 2v$$

Then,

$$\text{Fraction} = \frac{1.2v}{1.1(v + c)} = \frac{1.2v}{1.1(v + 2v)} = \frac{1.2v}{3.3v} = \frac{4}{11}$$

Honor role (solvers from Issue 3): Michael Avanessian (current student), Earth Sonrod (current student), Teresa Moore (current faculty)

Q: Does 6 divide $n(n^2 + 5)$?

Resp. 1: ...In all cases, $n(n^2 + 5)$ is divisible by 6, so the answer is yes.

Resp. 2: ...Therefore, we can conclude that 6 cannot divide $n(n^2 + 5)$ for any integer value of n.

Resp. 3: ...Therefore, we can conclude that 6 divides $n(n^2 + 5)$ if and only if n is divisible by 3.

Resp. 4: ...Therefore, 6 does divide $n(n^2 + 5)$ for any integer n.

Resp. 5: ...In summary, 6 divides $n(n^2 + 5)$ if and only if n is even and $k \equiv 1$ or 2 (mod 3), or if n is odd and $k \equiv 1$ (mod 3).

—ChatGPT