NC State Undergraduate Mathematics

Fall 2019

# Newsletter

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SUM Club

## Math Department Celebrates 130th Anniversary!

On the first weekend of October 2019, the Department of Mathematics celebrated 130 years of mathematics education at N.C. State with a two-day event that showcased how far the department has come since the Fall of 1889 and allowed both former and current math students to connect with each other.

The event started on Saturday October 5th in SAS Hall with a brief lecture on the history of the department. This was shortly followed by presentations in which faculty members shared their current research and their outreach activities. Afterwards, a variety of activities were available for event-goers to participate in, including Dr. Radmila Sazdanovic's Tess-celestial exhibit featuring tessellations of the geometric plane inspired by the interplay of art, nature, and mathematics; Dr. Lorena Bociu's Math Doesn't Bug Me exhibit teaching mathematics that is applied to biology and medicine through interactive activities and fun games; and Dr. Khai Nguyen's Putnam Problem Solving session, presenting challenging puzzles to participants with guidance from Putnam participants.

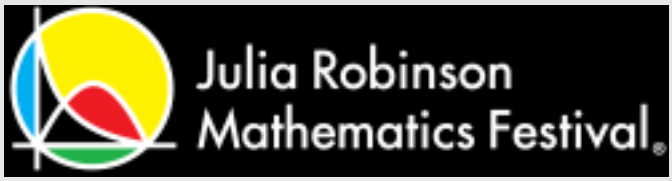
The afternoon of the 5th consisted of alumni panels from both industry and academia, panel discussions with current students, and a poster session showing off student research. The day was concluded at Hunt Library with a joint dance performance created by Dr. Tye Lidman and Raleigh's Black Box Theater, highlighting the relationship between topology and dance. The celebration finished on Sunday with a picnic at Pullen Park.

# Julia Robinson Mathematics Festival At NC State

October 20, 2019 | 1:00 pm - 4:00 pm in Talley Student Union Ballroom

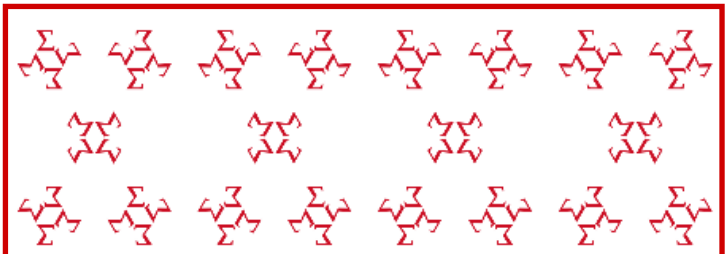
This year, the Society for Undergraduate Mathematics is hosting the first annual Julia Robinson Math Festival (JRMF) at NC State. Volunteers will help children in 4th-8th grades learn to find enjoyment through mathematical thinking and problem solving. The festival is supported with math problems and guidance from the national JRMF organization, with a range of difficulties appropriate for students regardless of their level of math. The problems will include puzzles and games to pique the interest of every student.

While UNC has hosted a festival in the past, the Wolfpack is finally taking its shot at putting one on. The event will encourage more students to learn a love for mathematics and to bring that love all the way to NC State. The event will be free to all the students, with the hope that those who may not have excess financial resources can still come and gain a deeper appreciation for math through a "Think and Do" approach.




# NC State Undergrads Win Big

Last March, six NC State undergrads attended the Triangle Junior Varsity Mathematics Competition at Wake Tech. This competition, for students who haven't yet taken any advanced math courses, is comprised of an individual round and a team round. The NC State team won first, and took the top four individual scores as well. Rishi Manoj placed first, Leah Gall placed second, and Arel D'Agostino and Matthew Sholar tied for third. The other NC State team members were Megan Pryor and Brooke Smith.



# Join Us for SUM Series

SUM Series features informal talks on mathematical topics. These talks are held Thursdays from 4:30 to 5:20 in SAS 2102 and are accessible to undergraduates in mathematics of all levels. This is a great chance to meet professors and learn about other areas of mathematics. You will have a few minutes to help yourself to pizza before the talk. For a schedule of upcoming talks, visit https://wp.math.ncsu.edu/sum/

# SUM Club



The Society for Undergraduate Mathematics (SUM Club) is a student organization for students with a passion for mathematics. We connect math undergrads and provide students with academic and professional development, leadership, and service opportunities. This is accomplished through social and outreach activities, presentations at meetings, career events, and other college- and university-wide involvement. Open to any student, math major or otherwise, we meet on the first and third Thursday of every month in SAS 2202 to get to know one another, do math puzzles, play games, learn together, and perform outreach. The club hosts undergraduates, graduate students, and professionals to share their experiences and knowledge. SUM Club supports the Raleigh community through participation in programs like Service Raleigh and Washington Elementary Math and Science Night. We hope to continue to create a strong undergraduate mathematics community. We would love to have more people involved! Email us at ncsusumclub@ncsu.edu with any questions or to be added to our email list.

# MIC Club

The Mathematical Insights Club (MIC) aims to foster an environment where undergraduate students can delve deeper into the field of mathematics. We will discuss undergraduate research, interesting papers, and math history. MIC is a platform for students to share their math interests. Each month two students give a short informal presentation on something they have found interesting, whether it is their own research, a published article, a fun problem, or math history. Come to MIC and advance your ability to discuss mathematics and give your CV a boost! We meet on the second Monday of each month in SAS 2202. We hope to see you there!

mathematicalinsightsclub@ncsu.edu

# Sports Analytics Club

The Sports Analytics Club at NC State is a student-run, student-driven club which brings together undergraduates, grad students, and faculty who are interested in the quantitative analysis of sports. We enable members to work on individual and group research projects under the guidance of grad students and our faculty advisors. In addition, we play fantasy sports and prediction contests together. We meet approximately bi-weekly on Mondays at 7:00pm in SAS Hall 2235. Email sportsanalytics@ncsu.edu if you would like to join our email list.

# Stat Club

If you are interested in statistics or related professions or just want to meet and socialize with other statistics lovers, come join Stat Club every other Thursday from 5:30-6:30pm in SAS 5270. The purpose of the club is to expose people to the endless applications of statistics and what a career in statistics really looks like by bringing in guest speakers from industry and academia. This is also a great way for members to network with industry professionals, NCSU faculty, and other statistics majors. Our next meeting will be October 31st where we will have a Halloween social. Come stop by for some tricks and treats and great times with new and old friends. If you have any questions or want to be added to the mailing list please email Emily Esterline at ejesterl@ncsu.edu. We hope to see you all soon!

# The Cubic Feud - A Historically Mathematical Poem

*The year was 1548; the place, Italy. Two mathematicians entered into public combat - not for their lives, but for something far more valuable: their reputations.*

For many a year, it did not appear that cubics had any solution.

Due to brave constitution and mathematical contribution,
A man named Ferro believed he'd found some headway.

But he passed away, so his work was left to Fiore, his stude.

Fiore so shrewd, challenged Tartaglia - another smart dude,
To a public battle of the brain.

Tartaglia couldn't refrain, from leaving Fiore slain, as his own equations
Were better in all regard.

Cardano - a scholar avant-garde, tried quite hard, to procure Tartaglia's formula
For his upcoming book.

Tartaglia eventually by persuasion overtook, gave away his equation - unknowingly to a crook! for his one and only request,

Was for Cardano to do his best, that the equation not be professed, but kept concealed.

Tartaglia nearly squealed, when his work was revealed, in Cardano's new text.

Enormously vexed, and at the deception perplexed, Tartaglia challenged Cardano to a duel of wits.

Not prone to fits, Cardano declined the blitz. His student Ferrari however,

Took up the endeavour, to prove he was more clever, than his master's rival.

The duel was not for survival, but rather for the deprival, of the opponent's public authority.

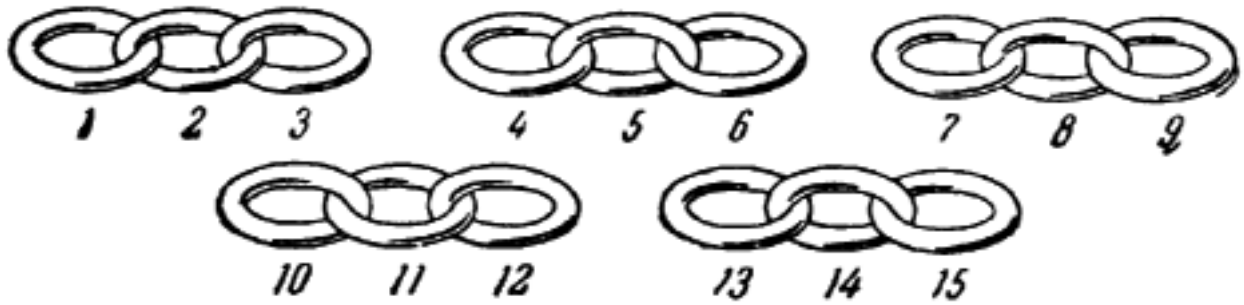
The public debate began with arguments apriority, but logical reasoning was in the minority. The two great mathematicians,

After a day of strong verbal emissions, were in quite equal positions, when Tartaglia considering himself mathematical overlord,

Left the figurative chessboard, and headed home-ward. The judges seemed to disagree,

And from his teaching post he was set free, but after this spectacle both sides just let it be.

# Puzzle Page

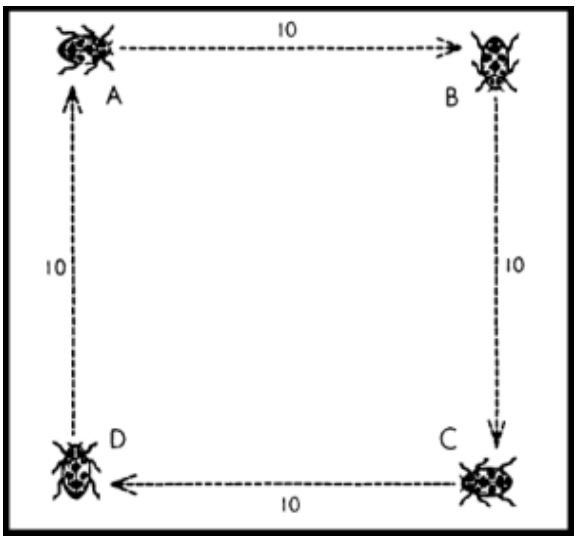



## The Weakest Link

A man has 5 pieces of chain that must be joined into a long chain. He can open ring 3 (first operation), link it to ring 4 (second operation), then unfasten ring 6 and link it to ring 7, and so on.
He could complete his task in 8 operations, but he wants to do it in 6. How does he do it?

## The Lonely Bugs

Four bugs -- A, B, C and D -- occupy the corners of a square 10 inches on a side. Simultaneously A crawls directly toward B, B toward C, C toward D and D toward A. If all four bugs crawl at the same constant rate, they will describe four congruent logarithmic spirals which meet at the center of the square. How far does each bug travel before they meet? The problem can be solved without calculus.




**IJSKMIJSRNV RHNOPYMV SKM VSPYQ BX VPNK SBLRNV JV CP-JHSRSQ, VSWPNSPWM, VLJNM, JHY NKJHUM. RS KJV HB UMHM-WJOOQ JNNMLSMY YMXRHRSR-BH. IJSKMIJSRNRJHV VMMZ JHY PVM LJSSMWHV SB XBWIPOJSM HMA NBHFMNSPWMV; SKMQ WMVBOEM SKM SWPSK BW XJO-VRSQ BX NBHFMNSPWMV DQ IJSKMIJSRNJO LWBBX.**

## Cryptogram

Cryptograms are simple-substitution ciphers where every letter of the alphabet has been switched. Your task is to use pattern recognition and your grammar and vocabulary abilities to decipher the hidden quote. Hint: start with the 1, 2 and 3 letter words, and remember that the most common letters in the English language are E-T-A-I-O-N, in roughly that order. Good luck!

Solutions are on page 7

# Upcoming Math Competitions

The William Lowell Putnam Competition is one of the most challenging math contests in the country. Participants are presented with two sets of proof-style problems, with three hours to work on each set. There are two competitions this semester:
**Virginia Tech Regional Math Competition**: October 26, 9am-11am
**Putnam Competition:** December 7, 10am-1pm and 3pm-6pm

For students interested in these competitions, Putnam problem sessions are held twice a week:
Tuesdays from 5-7 in the 1911 Building, Room 125
Fridays from 3-5 in SAS 2102
Contact Grant Barkley at gbarkle@ncsu.edu for more info.

# Mathematical Contest in Modeling

The Mathematical Contest in Modeling (MCM) is a five-day, international math competition that challenges undergraduate students in teams of three to apply their mathematical knowledge to real world problems. Past questions have included modeling the government of a Martian colony and assessing potential damage from an asteroid striking Antarctica. NC State has been very successful in the past, winning the top prize Outstanding designation in 2017 and winning multiple Meritorious designations every year. Jaye Sudweeks, a senior in applied math, and Graham Pash, also a senior in mechanical engineering and applied math, participated in MCM last year. "Despite the incredible challenge, the reward is well worth it, as Graham describes, "You spend 5 days working around the clock and absorbing all of the material that you can on the topic that you chose, so it's extremely rewarding to see it all culminate in this nice paper that you feel proud of and can show off." Jaye says: "... [T]he most important thing that I've learned about myself by participating in MCM is that I can do difficult things - there's so much power in being able to say that. I also learned that I can be creative and innovative, and those skills are not reserved for other people." The Math Department is interested in sponsoring more teams for the contest this coming Spring (dates TBA). Interested students should contact Sreeram (srvenkat@ncsu.edu) or Graham (gtpash@ncsu.edu).

# Student Excellence Award

The Student Excellence Award honors a senior who is considered a student leader and actively pursues leadership roles within the college and across NC State through community service, philanthropy, campus involvement, research or in the classroom. This year's award was presented to two students:

Grant Barkley is a senior majoring in mathematics and physics, and he's known for being one of the best undergraduate students in these fields at NC State. He is the president of the Student Undergraduate Mathematics Club and has been a guest speaker at other clubs in the College of Sciences. He also takes the time to help other students with their math assignments in a passionate and real way, and many have praised him for his supportiveness.

Natalie Truby is a senior studying microbiology. When she learned that a South Carolina college student was killed by someone impersonating an Uber driver, she took it upon herself to contact state legislators to lobby for a law that would increase safety for rideshare vehicles. One of the legislators she worked with eventually introduced the Passenger Protection Act, which ended up being one of the state legislative session's few significant bills to pass the House and Senate with no dissenting votes.

# Math Honors Program

Currently we have 43 students participating in the Math Honors Program. Lately about 15% of math graduates complete the Math Honors Program and nearly 90% of those students go on to excellent graduate schools or find great jobs. In the past, schools they have attended include Berkeley, Princeton, Stanford, MIT, Cornell, NYU and UCLA. Math honors students have received 25 NSF Fellowships AND 3 DoD Fellowships for graduate school as well as 9 Goldwater Scholarships, 1 Churchill Scholarship and 3 Gates Fellowships. Besides taking a number of challenging advanced Mathematics courses, Math Honors students also do research either at NC State or in a summer REU Program (Research Experience for Undergraduates) nationwide. More than 30 students have completed a study abroad program focusing on Mathematics, either at the BSM Program (Budapest Semesters in Mathematics) or the MiM Program (Math in Moscow Program).

Participation in REUs, BSM, MiM and doing undergraduate research in mathematics has helped greatly the success of honors students getting accepted into numerous excellent graduate schools. Dr. Min Kang is happy to talk to any student interested in undergraduate research opportunity in Mathematics – stop by her office in SAS 4114 or email her at kang@math.ncsu.edu for an appointment. More information about the program can be found on the Math Honors website at https://math.sciences.ncsu.edu/undergraduate/undergraduate-programs/math-honors-program/

Welcome to the Math Honors Program!

Bryant Cox
Nicholas Labaza
Laurel McCarthy
Caitrin Murphy
Jordan Paldino
Thomas Pfeifer
John Revelle
Olivia Simmons
Blake Sisson
Yinzhou Wang
Eric Zendels

For those who have interest in working as a researcher after graduating, participating in undergraduate research is a great asset. However, many students don't know how to locate or search for undergraduate research opportunities. An unofficial list of some undergraduate research opportunities and relevant internships can be found at www.go.ncsu.edu/sum_club_research

# MA 518: Geometry of Curves and Surfaces

Instructor: Irina Kogan iakogan@ncsu.edu
Class Meetings: MW 10:15-11:30 am in SAS 2102
Prerequisites: MA 242, MA 405

Would you ride a square wheeled tricycle? If this proposition sounds interesting, check out the National Museum of Math in New York City (or at least their website https://momath.org) and take this class. Curves and surfaces in 3-dimensional space are fun to study because they are easy to visualize, and you can understand quite a bit of the formal theory using only the tools of multivariable calculus and some linear algebra. This geometrically intuitive and classical subject has a broad range of applications including 3D movement and modeling in mechanics, computer imaging, robotics, aerodynamics, astronomy, etc. On the other hand, it serves as an excellent introduction to modern advanced differential geometry. In this class, while we introduce many important theoretical notions and results, the goal would be to experience and appreciate the theory through a variety of explicit examples.

# Puzzle Solutions

1) Open all 3 rings of 1 piece (3 operations). With these, link the other 4 together. Total: 6 operations.
2) 10 inches. No component of B's motion carries B toward or away from A, so for A it is as if B is stationary.
3) Decrypted text: Mathematics includes the study of such topics as quantity, structure, space, and change. It has no generally accepted definition. Mathematicians seek and use patterns to formulate new conjectures; they resolve the truth or falsity of conjectures by mathematical proof.