Mathematical Association of America
Fall 2017 Meeting of the
New Jersey Section

Georgian Court University
Jeffries Hall
Lakewood, NJ

Saturday, November 4, 2017

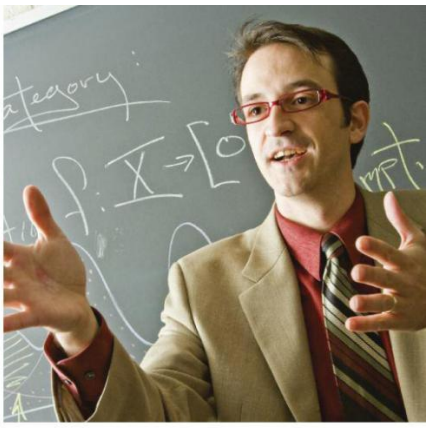
Abstracts and Biographies of Speakers

The Higher Dimensions of Calculus

Robert Ghrist
University of Pennsylvania

This talk will address certain challenges in teaching calculus, particularly multivariable calculus. Classical texts emphasize calculus in dimensions two or three, based on 19th and 20th century applications to physics. At present, many of our students are more motivated by data and systems in higher dimensions. How can a calculus course adapt to these needs, without weakening the subject material or sacrificing rigor? This talk will outline a plan for increasing both the dimension and sophistication of multivariable calculus instruction. Topics covered will include the use of visualization, matrix algebra, and differential forms.

Robert Ghrist (Ph.D., Cornell, Applied Mathematics, 1995) is the Andrea Mitchell PIK Professor of Mathematics and Electrical & Systems Engineering at the University of Pennsylvania. He is a recognized leader in the field of Applied Algebraic Topology, with publications detailing topological methods for sensor networks, robotics, signal processing, tracking, network discovery, and more. His prior work in leading the DARPA DSO SToMP project is complemented by NSF CAREER, NSF PECASE, SciAm50, and Vannevar Bush Faculty Fellow awards. Ghrist is also a dedicated expositor and communicator of Mathematics, with teaching awards that include the MAA James Crawford Prize, Penn's Lindback Award, and the S. Reid Warren award in Engineering at Penn. Ghrist is the author and animator of a popular MOOC on Calculus at Coursera, featured in the New York Times, BoingBoing, and Gizmodo.



New Roles of an Old Puzzle
The Magic Square of Squares Problem

Aihua Li
Montclair State University

The mystery, historical, and entertaining feature of the magic square puzzle has amazed and challenged many people -from all ages and with various background. It is also a great topic to be integrated in undergraduate classrooms and to be used for enriched activities outside the classroom. A more difficult related problem is the construction of magic squares of squares (all entries are perfect squares) and the existence of such squares with all entries distinct (still open). These puzzle-like problems always attract students' attention quickly. Through a series student research projects, we investigated a similar problem: construction and properties of magic squares of squares over a finite field or an integral domain. In this talk I will give a brief history about the problem and our approach to solving the problem.

Aihua Li is a professor of mathematics at Montclair State University. She received her Ph.D. from the University of Nebraska – Lincoln, specializing in commutative algebra. Her recent research involves topics in graph theory, number theory, algebra, and applications in bioinformatics. She received a 2013 Faculty Mentor Award from the Division of Mathematics and Computer Science of Council on Undergraduate Research (CUR). She is also recipient of Montclair State University Distinguished Scholar Award. In the past decades, she has mentored many undergraduate students on research projects in mathematics. She had directed REU programs for minority students (NREUP) and CURM teams sponsored by NSF through BYU. She had served as co-director for the Garden State Undergraduate Mathematics Conference from 2009 to 2013 and is currently chair-elect for the MAA New Jersey Section. Dr. Li has been a council member in the Council on Undergraduate Research (CUR) since 2013 and a current member of the MAA Committee on Undergraduate Student Activities and Chapters (ZNR).

Reflections on Mathematics for Human Flourishing

Francis Edward Su
Harvey Mudd College

Why does the practice of mathematics often fall short of our ideals and hopes? How can the deeply human themes that drive us to do mathematics be channeled to build a more beautiful and just world in which all can truly flourish? At the Joint Meetings in January, I gave this message---that the practices of mathematics helps people flourish---no matter what they choose to do with their lives or careers. I will reprise some themes from the talk, and describe some of the reactions I've received.

Francis Edward Su is the Benediktsson-Karwa Professor of Mathematics at Harvey Mudd College. He received his B.S. in Mathematics from the University of Texas at Austin and his Ph.D. from Harvard University. He is Past President of the Mathematical Association of America. His research is in geometric combinatorics and applications to the social sciences, and he has co-authored numerous papers with undergraduates. He has received multiple NSF research grants for his work. He also has a passion for teaching and popularizing mathematics. From the Mathematical Association of America, he received the 2001 Hasse Prize for expository writing, and the 2004 Alder Award and the 2013 Haimo Award for distinguished teaching. He authors the popular Math Fun Facts website and is creator of "MathFeed," the math news app. His hobbies include songwriting, gardening, photography, and theology. Just like mathematics, these are modes of creative expression that divinely blend structure and freedom, truth and beauty, reflection and action.

Workshop: Teaching Effective Mathematics Courses for Preservice Elementary Teachers
Presented by Cathy Liebars and Bonnie Gold

Abstract: In many mathematics departments, the course(s) for preservice elementary teachers are the unloved stepchild: left to adjunct faculty or non-tenure-track faculty, and often simply part of a broader general education course. But what your department does with these students will affect (literally) thousands of future elementary-school students' attitudes and abilities in mathematics. National recommendations are for courses that focus specifically on helping preservice teachers develop a deep understanding of the mathematics they will teach - which involves some quite sophisticated, college-level mathematics. In this workshop we will discuss both appropriate content and teaching methods for these courses, and hope that at least one faculty member from each institution, preferably one who is involved in teaching or overseeing these courses, attends.

Biographies of presenters: Cathy Liebars wrote her Ph.D. in probability theory, but has been working for the last 23 years in the mathematical education of both pre-service and in-service K-12 teachers at TCNJ. She helped found the New Jersey affiliate of the Association of Mathematics Teacher Educators (NJAMTE), and has served it in many capacities. She has also served as chair of MAA-NJ, as well as treasurer for many years. In 2016 she received the Sr. Stephanie Sloyan Mathematics Association of America New Jersey Section Award for Distinguished Service. At TCNJ Cathy has developed courses for both preservice elementary and secondary teachers and serves as Mathematics Education Coordinator in the Department of Mathematics.

Bonnie Gold's Ph.D. is in mathematical logic, but she moved in 1998 to Monmouth University in part because she wanted to get involved in the mathematical education of teachers. In 1999 she developed the first course at Monmouth specifically for preservice elementary teachers and served as its course champion until she retired in 2016. She also developed an interdisciplinary major at Monmouth for preservice elementary teachers that includes 5 mathematics courses. She has served in several capacities in NJAMTE and in MAA-NJ and has

received both MAA-NJ's teaching and service awards. She currently serves on the national MAA's Committee on the Mathematical Education of Teachers.

Abstracts of MAA-NJ General Contributed Paper Sessions

Organizer: Theresa C. Michnowicz, New Jersey City University
Room 105
Presider: Kathy Turrisi, Centenary University, turrisik@gmail.com

1:30-1:50: **Competing to Learn: An In-Class Playing Card Competition Where Students Explore Set Theory Operations**, Jonathan Weisbrod, Rowan College at Burlington County, jweisbrod@rcbc.edu

ABSTRACT: The students in a math for liberal arts class often are not intrinsically motivated to explore mathematics. The group playing card game presented in this paper eliminates grades as motivators and uses the students' natural competitiveness as a drive to dig deeper into their mathematical thinking. In order to win, students must optimize, logically predict other groups' hands, and stretch their set theory skills to score as many points as possible in the game. This activity serves as a low-risk formative assessment as it allows students to make mistakes and learn from them without grade penalties. The classroom becomes a natural low-threshold high-ceiling environment as every student regardless of skill level can participate. Since students compete in groups, the more-prepared students assist the less-prepared students for the benefit of the entire group. Finally, the instructor is able to reference this game to introduce new units in the course, such as logic and probability.

1:55-2:15: **The Mathematics and Physics of Watercolor Painting,** Ashuwin Vaidya, Montclair State University, vaidyaa@mail.montclair.edu

ABSTRACT: In his classic study in 1908, A.M. Worthington, a scientist, gave an intriguing account of liquid splashes and their formation through visualization experiments. The phenomenon of splashing is now recognized to be a highly complex and non-linear problem and has challenged the fluid dynamics and applied mathematics community for several decades now. Over the past decade or two, the subject of splashes has received an unexpected boost through the drip paintings of the well known artist Jackson Pollock. The physical processes and the mathematical structures hidden in his works have received serious attention and

made the scientific pursuit of art a compelling area of exploration. Our work, which is motivated by similar themes, explores the interaction of watercolors with canvas by means of simple experiments and mathematical modeling. In our experiments, we analyze conditions that create the plethora of settling patterns of droplets of watercolor paint on wet and frozen canvas. Our mathematical model, which is a reduced form of the Navier-Stokes and incompressibility equations, also considers the impact of canvas irregularities, temperature and fractal nature of the resulting patterns. The ultimate aim is to use our physical understanding of the flow process as a feedback to create new art.

2:20-2:40: **Number Theory Math Fair**, Amanda Beecher, Ramapo College of New Jersey, abeecher@ramapo.edu

ABSTRACT: Number Theory is an excellent source of fun topics that can expose many with limited background to see the beauty of mathematics, including children. In my 200-level Number Theory course, students were required to create a short hands-on learning activity appropriate for young children (elementary or middle school age) to learn about a number theory topic. We hosted a Math Fair on campus to share these activities with young people and the College community. This talk will discuss the logistics of hosting a Math Fair, the benefits to the students and young participants, and the multifaceted assignments that supported this activity in a 200-level course.

2:45-3:05: **Changing a Developmental Algebra Course in Order to Improve Student Outcomes: A Learning Experience**, Manuel Ferreira, Felician University, ferreiram@felician.edu

ABSTRACT: At Felician University, students take the Accuplacer placement test in the summer before their freshman year; this determines their math placement for the fall semester: one of two 4-credit developmental classes bearing no college credit – Math 001 (Prealgebra) or Math 002 (Algebra) – or various levels of college-level math. The developmental math courses are taught by full-time or adjunct members of the mathematics department.

Research shows that taking developmental math courses can be a financial burden on students, and students who take developmental courses are more likely to drop out and less likely to graduate. For these reasons, Felician made the

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MAA-NJ
Fall 2017 Meeting Program
All events are in Jeffries Hall

8:30 – 9:30	**Registration and Breakfast**; Hallway next to Little Theater
9:00 – 1:30	**Book Exhibits**; Hallway next to Little Theater
9:30 – 9:40	**Welcome by Mary Chinery, Ph.D., Dean of the School of Arts and Sciences;** Little Theater
9:40 – 10:30	**The higher dimensions of calculus,** *Robert Ghrist, University of Pennsylvania.* Presider: Lee Collins, County College of Morris; Little Theater
10:30 – 10:40	**Business Meeting**; Little Theater
10:40 – 11:10	**Intermission and Book Exhibits**; Hallway next to Little Theater
11:10 – 12:00	**New roles of an old puzzle: The magic square of magic squares problem,** *Aihua Li, Montclair State University.* Presider: Cihan Karabulut, William Paterson University; Little Theater
12:00 – 1:30	**Lunch**; North Dining Room
1:30 – 2:45	**Workshop**: *Teaching Effective Mathematics Courses for Preservice Elementary Teachers*, presented by Cathy Liebars, The College of New Jersey, and Bonnie Gold, Monmouth University (emerita), room 119
1:30 – 3:25	**Contributed Paper Session**; room 105
1:30 – 2:45	**NJ-NExT;** room 104
3:00 – 3:30	**Intermission and Refreshments**; hallway next to Little Theater
3:35 – 4:25	**Reflections on mathematics for human flourishing,** *Francis Edward Su, Harvey Mudd College.* Presider: Ik Jae Lee, Rowan University; Little Theater
4:30 – 5:00	**Reception;** Little Theater
5:30	**Dinner Honoring Speakers**

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decision to cut back on developmental math offerings and to give students a chance to earn college credit while taking Math 002. A pilot of a combined developmental/ freshman-level math course was run in Fall 2016.

The pilot course was a 6-credit course (3 credits developmental and 3 credits non-developmental) that combined the material from developmental algebra with the material from the freshman-level course called Quantitative Reasoning, a general-education topics course. This talk presents the results of this pilot program.

3:10-3:25: **New Results on the Integral Sum Graphs**, Haiying Wang, University of Mississippi

ABSTRACT: The concept of the integral sum graph was introduced by F. Harary in 1994. In this presentation I will show some new results on sum graph and integral sum graphs on relevant conjectures posed by Harary. We prove that there exists a connected integral sum graph with any minimum degree. An upper bound is given for the relation between the vertex number and the edge number of a connected integral sum graph with no saturated vertex.

Lunch Discussion Tables

Organized by Theresa C. Michnowicz, New Jersey City University.
There will be five discussion tables at lunch:

1. **Improving the Math Education of Elementary Teachers**, led by Cathy Liebars, The College of New Jersey, and Bonnie Gold, Monmouth University
2. **Class Projects Dealing with Big Data and Information of the PIC Math Program**, led by Aihua LI, Montclair State University
3. **MOOCs, YouTube Lectures, and the Future of Teaching,** led by Robert Ghrist, University of Pennsylvania
4. **Teaching Methods that Benefit All and that Disproportionately Benefit Women and Underrepresented Groups**, led by Francis Edward Su, Harvey Mudd College
5. **The Future of Our Section,** led by Grace Cook, Bloomfield College

Those who pre-registered have priority at these discussion tables. We look forward to a set of lively and interesting discussions!

NJ Section Representative Report from Mathfest 2017 (Chicago, IL)

Meeting of MAA Congress – July 26, 2017

This report marks my first as the Section's Representative to the MAA Congress.

The most significant piece of action by the Congress at its meeting in Mathfest was the approval of its own by-laws. These by-laws establish the role of the Congress, the role of its committees, and the role and election of its officers. It is worth noting that officers are elected by approval voting of the nominees and the Chair of the Congress is elected from nominees put forth from the Nominating Committee.

Small group discussions were held to discuss important issues such as promoting the new Instructional Practices (IP) Guide (forthcoming), connecting math to other disciplines, and increasing Section membership and participation. Regarding the latter, some ideas that I have passed on to our Section's executive committee include allowing PhD students from research universities to participate in Section NExT activities, having a contributed paper session for new faculty, and developing student activities connected with the Math Modeling Hub, a project being developed by QUBES in collaboration with SIAM, NCTM, COMAP and MAA based on the GAIMME Report.

Please feel free to contact me by email (nguyen@rowan.edu) if you have questions or concerns.

Respectfully submitted,
Hieu Nguyen,
MAA Congress Representative, New Jersey Section

Book Sales at the Meeting

The discounted meeting price for MAA books (35%) also applies to books *not* currently on display. When you order books at the meeting, there are no shipping costs. Since MAA books will now be published by AMS, there will be a delay in shipping during the transition period. It is estimated that books ordered at the meeting will ship shortly after January 1, 2018.

We will again offer "order one, get one free" at this meeting.

Future Meetings

MAA-NJ. The Spring 2018 MAA-NJ Section meeting will be held on the Mount Laurel campus of Rowan College at Burlington County on Saturday, April 7, 2018.

GSUMC. The Garden State Undergraduate Mathematics Conference (GSUMC) will be held in conjunction with the Spring Meeting of the NJ Section at Rowan College at Burlington County. The conference will include poster and oral presentation sessions for undergraduate students, as well as a team mathematics-problem competition. There are many opportunities for faculty to participate in co-organizing the conference. Contact david.trubatch@mail.montclair.edu to volunteer. For additional details see the GSUMC web site: http://sections.maa.org/newjersey/GSUMC/GSUMC.htm

National MAA Meeting. The 2018 Joint Mathematics Meeting will be in San Diego, January 10 – 13.

MathFest. The MAA will hold its 2018 MathFest in Denver, CO, August 1 – 4.

Call for Contributed Papers and Lunch Table Discussion Topics for the Spring 2018 MAA-NJ Meeting

There will be two special contributed paper sessions. All papers will be reviewed by the organizers. Please submit a title, three- to four-sentence abstract, and one-page description in MS Word format by February 2, 2018 to the session organizer.

1. **Recreational Mathematics**. Organizer: David Nacin, William Paterson University, nacind@wpunj.edu
2. **My Favorite Classroom Activity**. Organizers: Jonathan Weisbrod, Rowan College at Burlington County, jweisbrod@rcbc.edu, and William Whitfield, Rowan College at Burlington County, wwhitfield@rcbc.edu

MAA members interested in leading a Lunch Table Discussion at the Spring 2018 meeting are asked to submit their proposals to Theresa C. Michnowicz, New Jersey City University, tmichnowicz@njcu.edu, by **February 2, 2018.**

Call for Nominations for the MAA-NJ Award for Distinguished College or University Teaching

The MAA-NJ Section Distinguished Teaching Award Selection Committee is seeking nominations for the 2018 award. Please consider nominating an inspiring, respected, or influential deserving colleague for this prestigious award. Nomination information is posted at http://www.maa.org/newjersey. For additional information you may contact Zhixiong Chen (Secretary, MAA-NJ) at zchen@njcu.edu. Nominations are due by November 20, 2017.

Social Media Information

A message from social media director Grace Cook, Bloomfield College. Check us out!

Email: maanj.socialmedia@gmail.com
Facebook: https://www.facebook.com/maanewjersey
Instagram: https://instagram.com/maanewjersey
Twitter: https://twitter.com/maanewjersey

MAA-NJ Committees

Awards Committee: Karen Clark (ex-officio), The College of New Jersey; Amy Cohen, Rutgers University; Thomas Hagedorn, The College of New Jersey; Theresa Michnowicz , New Jersey City University.

Nominating Committee: Karen Clark (ex-officio), The College of New Jersey; Aihua Li, Montclair State University; Hieu Nguyen, Rowan University; Jonathan Weisbrod, Rowan College at Burlington County.

Teaching Award Committee: Karen Clark (ex-officio), The College of New Jersey; Brian Hopkins, Saint Peter's University; Sarita Nemani, Georgian Court University; Dirck Uptegrove, Nokia.

Committee for Contributed Papers: Grace Cook, Bloomfield College; Srabasti Dutta, Ashford University; Theresa Michnowicz (ex-officio), New Jersey City University; Kathy Turrisi (chair), Centenary University.

Organizing Committee: Amanda Beecher, Ramapo College; Zhixiong Chen, New Jersey City University; Karen Clark, The College of New Jersey; Grace Cook, Bloomfield College; Jana Gevertz, The College of New Jersey; Bonnie Gold, Monmouth University; Zachary Kudlak, Monmouth University; Ik Jae Lee, Rowan University; Aihua Li, Montclair State University; Theresa C. Michnowicz, New Jersey City University; Sarita Nemani, Georgian Court University; Hieu Nguyen, Rowan University; Linda Ritchie, Centenary University; A. David Trubatch, Montclair State University; Kathy Turrisi, Centenary University; Dirck Uptegrove, Nokia; Elizabeth Uptegrove, Felician University; Paul von Dohlen, William Paterson University; Jonathan Weisbrod, Rowan College at Burlington County.

Section History Committee: Grace Cook, Bloomfield College; Thomas Hagedorn, The College of New Jersey (chair); Aihua Li, Montclair State University; Theresa C. Michnowicz, New Jersey City University.

Hosting Committee: Lei Cao, Banani Dhar, Sarita Nemani, Georgian Court University.

Dinner Honoring the Invited Speakers. The Section will honor the invited speakers at dinner following the meeting. Everyone is cordially invited.

Acknowledgments. MAA-NJ thanks the Department of Mathematics at Georgian Court University for their kind hospitality in hosting the meeting.

We thank Princeton University Press and World Scientific Publishing for their generous donations for silent auction and door prizes.

NJAMTE Call for Papers. The New Jersey Association of Mathematics Teacher Educators invites contributed papers (15 – 25-minute talk plus 10 – 15-minute discussion) at its 2018 meeting on June 2 at The College of New Jersey. Any talk about research results, professional development, or issues of concern to mathematics teacher educators will be considered. For details, see http://bit.ly/njamte or contact Erin Krupa at krupae@mail.montclair.edu.

Join the MAA! http://www.maa.org/membership/join_main.html

MAA-NJ Section Officers

Congress Representative	Hieu Nguyen, Rowan University
Chair	Karen Clark, The College of New Jersey
Chair-Elect	Aihua Li, Montclair State University
Secretary	Zhixiong Chen, New Jersey City University
Treasurer	Paul von Dohlen, William Paterson University
Vice-Chair for Fall Meetings	Sarita Nemani, Georgian Court University
Vice-Chair for Speakers	Amanda Beecher, Ramapo College
Vice-Chair for Spring Meetings	Elizabeth Uptegrove, Felician University
Vice-Chair for Student Activities and GSUMC Director	A. David Trubatch, Montclair State University
Vice-Chair for Two-Year Colleges	Jonathan Weisbrod, Rowan College at Burlington County
Book Sale Coordinators	Dirck Uptegrove, Nokia; Elizabeth Uptegrove, Felician University
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Program Editors	Kathy Turrisi, Centenary University; Elizabeth Uptegrove, Felician University
Project NJ-NExT Director	Jana Gevertz, The College of New Jersey
Social Media Director	Grace Cook, Bloomfield College
Webmaster	Dirck Uptegrove, Nokia
Workshop Organizer	Zachary Kudlak, Monmouth University