# THE SEAWAY CURRENT

Newsletter of the Seaway Section of the Mathematical Association of America

SPRING 2019
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**THE SEAWAY CURRENT**

The Seaway Current is published at least twice per year by the Seaway Section of the Mathematical Association of America (MAA) for the benefit of its members. Its pages are open to all members of the MAA and, by invitation to others, for the exchange of information and opinion. Contributed announcements, articles, and editorials are welcome and should be sent to the editor.

Material may be submitted to the editor by e-mail. Opinions expressed in this newsletter are those of the editor or of individual contributors and do not necessarily represent the views of the MAA or of the Seaway Section.

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## St. John Fisher College will host the SPRING 2019 meeting, April 5-6, 2019.

St. John Fisher College, located in beautiful Pittsford, New York, is an independent institution with Schools of Arts and Sciences, Business, Education, Nursing, and Pharmacy. With 11 people steering the Mathematics Department, students enjoy a 12:1 student to faculty ratio and wide range of class offerings. The program website states, "As a math major, you will use logic and insight to analyze problems, develop solution strategies, implement those strategies, and interpret the results. Your teachers will encourage you to reflect on the entire process, to see how it might be improved and generalized." (St. John Fisher College Mathematics)

*Thank you, St. John Fisher College, for hosting our meeting!*

## SPRING 2019: THE INVITED SPEAKERS

**Friday Banquet Speaker:**
Rebekah Yates, Houghton College

**Title:** *All Natural $\pi$*

**Abstract:** Tired of $\pi$ being irrational? Wish your circles were squares? So did Edward J. Goodwin, author of the infamous Indiana Pi Bill in 1897. In this talk, we'll explore how he might not have been as wrong as we think, as long as we're willing to change our metric.

REBEKAH YATES is an associate professor and chair of the Math Department at Houghton College in Houghton, NY, a hamlet 15 minutes south of Letchworth State Park. She is a graduate of Wheaton College in Wheaton, IL, after which she spent a year teaching middle school mathematics in the Atlanta area. She then earned her M.A. in algebra and her PhD in functional analysis at the University of Montana in Missoula, MT. She currently works in matrix analysis and dabbles in mathematics education. In her spare time, she aspires to be the Ms. Frizzle of mathematics, she runs, and she and her husband raise their children to not fear fractions.

**MAA Mathfest 2019**: July 31 - August 3, 2019 in Cincinnati, Ohio
**FALL MEETING 2019**: November 1 & 2, 2019 at Ithaca College
**MAA-AMS Joint Math Meetings**: January 15 -18, 2020 in Denver, Colorado
**SPRING MEETING 2020**: May 1 & 2, 2019 at the University of Waterloo

# SPRING 2019: SATURDAY INVITED SPEAKERS

## A Rare Glimpse of PDEs in Their Natural Habitats

David Ross, Rochester Institute of Technology

**Abstract:**
Too often mathematicians study differential equations in a sterile, overly abstract manner, divorced from the equations' meaning and purpose. In this talk Dr. Ross will discuss PDE that arise in various fields. Rather than stress how theoretical mathematics contributes to these fields, he will stress how understanding the meaning and purpose of the PDEs in application fields can, and should, inform, enrich, and shape, mathematical theory.

Over the past three decades, **DAVID ROSS** has worked as an applied mathematician at Kodak Research Labs, Kaiser Permanente, and at the biotech startup Archimedes. He is currently Professor of Mathematics at RIT, and he has also taught at NYU, the University of Rochester, and the University of Virginia. He took his BA in math from Columbia and his PhD from the Courant Institute where he wrote a dissertation on aerodynamic shock waves and transonic wing design. He has worked in traditional photography, digital imaging, optics, xerography, immuno-assay chemistry, microelectronic fabrication, MEMs, and many other fields as an industrial mathematician. These days, with colleagues at RIT's Center for Applied and Computational Mathematics, he collaborates with Bausch & Lomb on contact lens design, with Merck on cell-signaling models of bone homeostasis for studying osteoporosis treatments, and with Amgen on modeling the dynamics of bispecitic T-cell engagers for cancer treatment. All of his work has been, mathematically, the application of dynamical systems and PDE theory to industrial problems.

## Tales of Impossibility

Dave Richeson, Dickinson College

**Abstract:**
"Nothing is impossible!" It is comforting to believe this greeting card sentiment; it is the American dream. Yet there are impossible things, and it is possible to prove that they are so. In this talk we will look at some of the most famous impossibility theorems - the so-called "problems of antiquity." The ancient Greek geometers and future generations of mathematicians tried and failed to square circles, trisect angles, double cubes, and construct regular polygons using only a compass and straightedge. It took two thousand years to prove conclusively that all four of these are mathematically impossible.

**DAVE RICHESON** is a professor of mathematics at Dickinson College in Carlisle, PA, and is editor of *Math Horizons*. He received the MAA's Euler Book Prize for his book, *Euler's Gem: The Polyhedron Formula and the Birth of Topology*. He second book, *Tales of Impossibility: The 2,000-year Quest to Solve the Geometric Problems of Antiquity*, will be published by Princeton University Press in October. He is especially excited to speak in the Seaway Section of the MAA because he grew up in Rochester, NY, and he attended Hamilton College.

## The Shocking Story of Crowds

Carl Lutzer, Rochester Institute of Technology

**Abstract:** In recent years, designers of video games have recognized that un-natural crowd flows can draw players out of the immersive experience. Crowd flow is also important to those who design public spaces to avoid trampling and crushing tragedies. Much of this talk will revolve around a mathematical model, originally formulated by Roger Hughes, that blends ideas from psychology and fluid mechanics to describe the motion of a crowd. The mathematical model will be presented in a way that is accessible to students with (a) experience being in a crowd, and (b) knowledge of multivariable calculus. A simple example will be explored, and we will see that even in simple cases the equations lead to interesting mathematical behavior. If time permits, the talk will include brief remarks on numerical simulations that provide evidence to guide mathematical investigation.

**CARL LUTZER** completed his Ph.D. in 2000 under the supervision of Dr. Peter Hislop at the University of Kentucky. Since then he has been a faculty member at the Rochester Institute of Technology, where he has participated in a wide variety of research efforts ranging from studies of probability and topology to the dynamics of a micro-electromechanical systems and mobile ad-hoc networks. RIT has also been a place where Dr. Lutzer has been able to continue developing his skill as a teacher. In 2006 he won the MAA's Carl B. Allendoerfer Award for Expository Excellence, in 2013 he earned the university-wide Eisenhart Award for Excellence in Teaching, and he was awarded the Clarence F. Stephens Distinguished Teaching Award in 2017. Dr. Lutzer is currently serving as the Interim Head of the RIT Honors Program, and in his spare time he enjoys reading about history, playing soccer, and running.

# SPRING 2019: SPECIAL EVENTS

## FRIDAY

### Seaway NExT: Flipped Learning Workshop

**Facilitated by:** Joseph Petrillo (Alfred University)
Friday, April 5, 2:00 - 5:00
St. John Fisher College, Nursing 105

*Abstract:* Flipped learning is the process by which the transmission of course information occurs before the class meeting. Students spend class time developing their understanding while the teacher provides support and guidance. This Flipped Learning Workshop will provide justification and motivation for considering a flipped-learning approach, step-by-step guidance on how to get started, and a breadth of resources through which teachers can customize an approach for their individual abilities and needs.

All are welcome to attend the Seaway NExT workshop. If interested, check the box on the meeting registration form and email Nathan Reff (nreff@brockpoert.edu) to confirm.

### Math Trivia Contest

**Hosted by:** Blair Madore (SUNY Potsdam)
Friday night, following the banquet speaker
St. John Fisher College, Kearney Hall, Cleary Auditorium

*Description*: All (students and faculty) are welcome to participate in round one of this mathematics trivia contest. The top scorers from round one will form teams and play a round of Jeopardy to determine the champions. There will be prizes!

## SATURDAY

### Section Elections - SPRING 2019

During the Business Meeting on Saturday, April 6, elections for the officers of Secretary and Two-Year College Representative (formerly "Second Vice-Chair") will take place. The nominations brought forth by the Nominations Committee, appointed by the Section Chair and consisting of Joe Straight (chair), Gary Towsley, Ryan Gantner, Dan Visscher, and Cheryl Miller, are as follows:

- Secretary: Gary Raduns, Ithaca College
- Two-Year College Representative: Steve Kilner, Monroe Community College

Both nominations are for incumbent officers. Additional nominations may be made from the floor during the Business Meeting, when the vote will occur.

### Let's Chat about I.L.

**Facilitated by:** Olympia Nicodemi (SUNY Geneseo)

A liberal arts education is best when its students can integrate knowledge across disciplinary boundaries so as to see issues, problems, and potential solutions addressed from multiple viewpoints and with a variety of skills. Many of us have had experiences implementing integrative learning (I.L.) opportunities for our students. Let's spend some time talking about how we have done so (or hope to do so) and what the hurdles might be. This will be a session with no formal "talk" but rather a chance to share and learn from each other.

### A Uniform Geometry for High School, University, and Theoretical Mathematics

**Speaker:** David M. Clark, SUNY New Paltz

*Abstract:* This talk will present a single formulation of Euclidean geometry that is rooted in high school mathematics, can be taught at a deeper level to pre-service high school teachers in colleges and universities and that has a full foundation at the research level. Building this formulation began by looking at what high school students most need from geometry. It then offered a college geometry course for pre-service teachers to prepare them to meet those needs. Finally a mathematically complete version of this same geometry is now being written to support university instructors of those teachers.

### Workshop on Leadership in the Mathematical Sciences

**Facilitated by:** Mihail Barbosu (Rochester Institute of Technology)

*Topic:* Pre-tenure and post-tenure faculty evaluation.

### Student Learning and Success in Entry-level Mathematics:

*Math Pathways, Corequisite Instruction, and Mathematics Learning by Inquiry*

**Facilitated by:** William Jaco (Oklahoma State University)

*Description:* We will facilitate a discussion of the program led by the Oklahoma State Regents for Higher Education to enhance student learning and success in mathematics across Oklahoma. We will discuss the structures of Math Pathways (to Completion) and Corequisite Instruction (at Scale) that are being implemented at all public institutions of higher education across Oklahoma, taking a closer look at these structural changes at Oklahoma State University. While these structural changes are not easy, they are fairly straightforward and from them we are seeing measurable successes. However, a consequence of these changes and the need to address the Task Force Goals for enhanced student engagement, increased applications of mathematics and support for academic success skills dictate necessary classroom instructional changes that will require a shift in departmental culture and faculty and advisor professional development. The newly funded Mathematics Inquiry Project is a statewide program to address these challenging changes. Pilot projects are showing excellent success.

### IBL Special Session: Pieces of IBL – how to implement elements of Inquiry-Based Learning

**Facilitated by:** Rich Spindler (SUNY Plattsburgh) and Matt Thomas (Ithaca College)
Saturday, April 6, 4:30-7:30
St. John Fisher College, Basil 200

*Description:* There are plenty of reasons why you might not want a class to be entirely IBL-based. There might be particular courses, semesters, or groups of students where you'd like to moderate the use of inquiry-based methods. In this workshop, we'll discuss ways that you could implement (or have implemented) pieces of IBL or IBL-like activities.

All are welcome - whether this is your first time trying IBL and want to get your feet wet before diving in, or a seasoned IBL users who might not want a particular class to be entirely IBL. All current or future educators are particularly welcome to intend. This event is organized by Ryan Gantner and sponsored by Upstate NY IBL Consortium. To register check the box on the registration form; dinner is provided complements of the Upstate NY IBL Consortium.

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# Math Headlines – Share 'em @MAASeaway

**"Physicists are decoding math-y secrets of knitting to make bespoke materials"** – Jennifer Ouellette, March 8, 2019 from arstechnica.com

**"The Entertainer"** by Jim Henle, February 26, 2019 from The Mathematical Intelligencer & Scientific American

**"Outward-Facing Mathematics: A Pitch"** by Jordan Ellenberg, *Notices of the American Mathematical Society (March 2019, vol. 66(3))*.

# JMM 2019 Highlights

Miss out on the Joint Math Meetings this year? **You're not alone!** For many of us in the Seaway Section, the Baltimore, Maryland location was tantalizingly close . . . just a few hours by plane, train, or car and yet, impossibly far away. You can catch a quick glimpse of the meetings through the video, *JMM by the Numbers*, produced by the AMS.

Looking for a few personal insights on the meetings? Patti Frazer Lock, St. Lawrence University, wrote to say, "I did go to JMM, but I was at meetings most of the time that I was there, and I was only there Friday and Saturday. I went to two sessions, one on Stat Ed and one on WebWork and Technology." Mike Gage, University of Rochester, attended JMM but spent most of his time teaching a minicourse, *Minicourse #3. Advanced Authoring in WeBWorK: Turn good math problems into great ones & submit them to the OpenProblemLibrary* and giving a presentation titled, "Using WeBWorK with WebSim, SageMath and Geogebra to teach the simplex method, linear algebra and other aspects of a Linear Optimization course." Ryan Gantner, St. John Fisher College, writes:

> One thing I attended at JMM was David Bressoud's presentation on "Reflections on Teaching Calculus for the First Time, 45 Times." The title alone was enough to captivate my attention because that's about how I feel when teaching calculus. And while it it hasn't *quite* been 45 times for me, it does feel that I am never quite satisfied with either the way I have taught it or the content that I have included in the course. . . . this talk was both a personal journey through Bressoud's own discovery of the teaching of calculus and an interactive presentation. He organized the talk chronologically, from when he taught at Penn State and his thoughts at delivering classes there, then moving to his current job at Macalester. He would occasionally ask the audience questions, giving us time to converse with our neighbors about the issues he had raised, before some of us shared with the entire room. I had the fortune of sitting next to Sandra Laursen and Chris Rasmussen, two rock stars in the math education research world, so my conversations were much more vibrant because of them. Overall, it was interesting to hear Bressoud describe the change in his thinking about how he changed from being a polished lecturer, to thinking that all of calculus needed to be modeling something in the "real world", to thinking that students can (and need to) do much of the thinking and discovering for themselves – and that these concepts are not mutually exclusive.

Feeling nostalgic? Or maybe you'd like to immerse yourself in January?! Check out the slew of videos that are posted on YouTube (by the AMS) to recapture that *JMM feeling*. Check out "The Inclusion Principle: The Importance of Community in Mathematics" by retiring MAA President Deanna Haunsperger or "A Dream Deferred: 50 Years of Blacks in Mathematics" by Edray Herber Goins. And, stretch yourself with "Immunology for Mathematics" by Alan S. Perelson or follow "A Mathematical Journey of Culture, Community, and Collaboration" with Pamela Harris.

## Apply to host a Seaway Distinguished Lecturer!

While preference will be given to institutions not typically represented in strong numbers at the Seaway Section meetings, all institutions are encouraged to apply. Submit the following to Charlie Jacobson, chjacobson@elmira.edu, by **April 30, 2019**:

1. The department's preference from the list of prepared talks the Lecturer can provide.
2. A list of dates in the coming academic year that the institution would be able to host a visit. The list should be in order of the institution's preference and note where dates coincide with an event at the institution.

See the flyer for details!

## Congratulations to Bob Rogers, 2019-2020 Seaway Distinguished Lecturer!

The Seaway Section takes great pride in naming Bob Rogers the 2019-2020 Seaway Distinguished Lecturer. Bob is a beloved faculty member in SUNY Fredonia's Dept. of Mathematical Sciences, one known across the section for his efforts to build bridges between K-12 mathematics teachers, math teacher educators, and math faculty at large.

We are delighted that Bob is sharing his energetic advocacy, experience and mathematical insight through the Distinguished Lecturer program and the selection committee invites you to take advantage of this opportunity!

Challenge of the Edition: How many exclamation points can you count in this edition of the Seaway Current? The reader with the correct number wins undying editorial respect!

# AN INVITATION FOR YOUR DEPARTMENT

MAA
MATHEMATICAL ASSOCIATION OF AMERICA

## Announcement

The Seaway Section of the Mathematical Association of America is pleased to announce that we have selected **Dr. Bob Rogers** of SUNY-Fredonia to serve as our **Distinguished Lecturer** of the Seaway Section for the 2019-2020 academic year. Throughout his career, Bob has been an energetic and effective advocate for mathematics and mathematics education. He has been an editor for the New York State Mathematics Teachers' Journal, president of the AMTNYS, chair and governor of the Seaway Section, and continues to be an active participant in the mathematics community, not only through the AMTNYS and MAA, but also as a current member of the governing board for the NYS STEM Education Collaborative. We are delighted that he will add the Distinguished Lecturer position to his list of accomplishments, and look forward to seeing what he will bring to the second year of this rewarding program.

## Invitation

We invite all mathematics departments in the area to apply for the opportunity to host a visit from the Distinguished Lecturer. The lectures are intended for student audiences, and so would be appropriate for inclusion as a part of department or campus events involving students at which a guest speaker would be included, such as honor society inductions, student seminars, or other suitable occasions. While preference will be given to institutions which are not typically represented in strong numbers at the Seaway Section meetings, all departments are encouraged to apply. The Section will bear the costs of the Lecturer's travel, meals, and lodging. We anticipate funding three visits in the fall term, and three in the winter term. Departments wishing to apply for the program should submit the following to **Charlie Jacobson, chjacobson@elmira.edu**, by April 30, 2019:

1. A list of dates in the coming academic year that your department would be able to host a visit. The list should be in order of your preference. If the dates coincide with an event at your institution (such as a honor society induction or student seminar series), please let us know that, too.
2. An indication of your department's preference from the list of the Lecturer's prepared talks and topics (listed to the right).

## THE DISTINGUISHED LECTURER OF THE SEAWAY SECTION

### STEM Talks and Topics:

- Connecting STE to M
- Bernoulli's Solution to the Brachistochrone
- How to Draw a Straight Line: Introduction to Linkages
- Divisibility and Error-Detecting Codes
- New Tricks for Old Curves
- Nano-Polyhedra
- RSA Encryption

### History of Mathematics:

- "Fredonia" Rogers and the Problems of Algebra
- "Fredonia" Rogers and the Secret to Solving a Cubic
- "Fredonia" Rogers and the Math Behind the Symbols
- "Fredonia" Rogers and the Quest to Make Imaginary Numbers Real
- "Fredonia" Rogers and the Origins of Proportional Reasoning
- "Fredonia" Rogers and Pre-Calculus Precalculus

### Teaching Calculus:

- Limits Belong at the End of Differential Calculus, Not in the Beginning
- Riemann Sums Belong at the End of Integral Calculus, Not in the Beginning
- Stop Teaching the Chain Rule (And Still Teach Calculus)


The members of the Distinguished Lecturer Selection Committee:

| | |
|---|---|
| David Brown | dbrown@ithaca.edu (2018-19 Distinguished Lecturer) |
| Jonathan Cox | Jonathan.Cox@fredonia.edu (section chair, *ex officio*) |
| Charlie Jacobson | chjacobson@elmira.edu (committee chair) |
| Jeff Johannes | johannes@geneseo.edu |
| Olympia Nicodemi | nicodemi@geneseo.edu |
| Gary Towsley | towsleyg@geneseo.edu (section treasurer, *ex officio*) |
| Elizabeth Wilcox | elizabeth.wilcox@oswego.edu |

# Play It Again, Seaway

## A Note from the Section Chair

Well, it's hard to believe, but my two-year term as chair of the section is already coming to a close. This might well be the last time I address you in this forum. So I want to leave you with a very important reminder. It's the same insight an external program reviewer recently gifted to our department at Fredonia. These are difficult times in higher education (and overall), particularly in our region. And the situation may well get worse. It is easy to be consumed by the problems and focus on the negatives. Don't lose sight of this: **You are doing great work!** And it is pivotal work too. I'd especially like to encourage the many of you who teach. Henry Adams said, "A teacher affects eternity; he can never tell where his influence stops." I've never forgotten a perspective that Cheri Boyd shared years ago, which I'll adapt here. When you journey to campus in the morning, consider that Ryan Gantner is also heading in to St. John Fisher. Think that Elizabeth Wilcox is making her way to Oswego State. Picture Steve Kilner traveling to Monroe Community College and Jane Cushman commuting to Buffalo State in her electric car. And on and on, multitudes across the section are carrying on our noble profession in fellowship with you. **You are not alone!** You are part of a community that cares, a tireless community dedicated to empowering people and changing lives through mathematics.

Together we have accomplished some great things over the past couple years. Some of them were so much fun that we're going to do them again! After a wonderful meeting at University of Toronto – Mississauga last fall, we're heading back to Canada! The Spring 2020 meeting will be hosted by the University of Waterloo on May 1st and 2nd. The inaugural year of the Seaway Section Distinguished Lecturer program was a tremendous success, thanks to the excellent efforts of Dave Brown and the Seaway Distinguished Lecturer Committee. Let's go another round! I'm thrilled to announce that Bob Rogers has been selected as the 2019-2020 Distinguished Lecturer. Bob is an incredibly entertaining speaker. Once, I was laughing so hard at a talk he gave that I got a leg cramp and almost kicked over the projector! Yet, in his talks he also provides unique perspectives and raises crucial (and sometimes controversial) ideas that are not addressed in usual mathematics coursework or discourse – but should be. Don't miss out on the chance to go on an adventure with "Fredonia Rogers"! Apply for a visit from the distinguished lecturer, following the guidelines included in this issue. How about revising the bylaws again? No thanks! I actually already did that twice – simultaneously with the Seaway bylaws revision, I was playing the lead role in a revision of the bylaws at my church. So, let's leave that for the next generation.

Of course, we're also continuing to break new ground. Apparently for the first time ever, the Seaway Section has an official logo, selected by your vote! We're conducting a social-media-based photo contest at the spring meeting, which will also feature an ambitious business, industry, and government professions event. And the section leadership is engaged in planning a themed Year of Diversity for 2019-2020. You'll go forward into this exciting future under the capable guidance of Cheryl Miller, to whom I'll pass the torch after the April meeting. She brings a different style, perspective, and strengths that will once again invigorate the section. I love the section's governance structure that values continuity and experience while at the same time regularly bringing in new voices. Furthermore, it is the only organization I'm involved with that is financially stable! These are just a couple of the many things to love. It can be easy to take for granted the incredible regional math organization in which we are privileged to be partners. Take a step back, and contemplate and appreciate all that we are and have achieved.

To drive home this point, let me close with a longer view of just a few highlights from my time in the section. From Joe Gallian closing his banquet talk with a Beatles song accompanied by group-theory-based psychedelic imagery, to John Maceli spontaneously producing dozens of decks of cards and teaching us magic tricks, to Steve Strogatz painting a moving portrait of his high school teacher Don Joffray, to Jeff Weeks taking us on a visual adventure through higher dimensions, to Chris Leary's mind-blowing narrative culminating with the nugget "Aw, Dad, I wanted to put it together myself!" that has shaped my teaching ever since, to the many inquiry-based learning workshops and talks that have fueled my journey of change, to Blair Madore's entertaining and engaging game show nights, it's been a wild ride. Would I do it all again? You bet. It's the section so nice, I'd chair it twice! We won't always be here; we won't always have this blessing. So, keep on doing what you do best – it's working! And I will too. Then we'll always be together in spirit.

# Section Notes
## Spring 2019

### SUNY Plattsburgh:

With a bittersweet taste, the SUNY Plattsburgh Mathematics Department announces that Margaret Morrow, active member of the Seaway Section, retired from the faculty of SUNY Plattburgh in December 2018, after 19.5 years with the Mathematics Department. Margaret plans to enjoy her retirement by engaging in activities such as reading, appreciating music, practicing yoga, square dancing, cooking, gardening and reconnecting with some interests from a long time ago - currently pottery and ancient literature - but we will continue to see her at Seaway Section meetings. Best wishes, Margaret! *(Submitted by Sam Northshield)*

### Seaway Section: Facebook Group

First a newsletter, then a website, and now a Facebook group? That's right! Check out @MAASeaway and join the group to get updates on all things Seaway . . . and if you have ideas for other social media platforms the Section should investigate joining, contact our Public Information Officer, Christine Uhl.

### Seaway Section: Be a Liaison!!

There's no reason why your institution needs only ONE liaison – the position is no longer associated with a free MAA membership. And it's better to have *two* people in your department passing on flyers, printing schedules, gathering info for the Section Notes part of the Current, . . . Contact Jeff Johannes (johannes@geneseo.edu) to get on the email list and be at the front of the line to get info from the Section!

### Seaway Section: Give a contributed talk!

A contributed talk can be on an expository topic. A contributed talk can be about pedagogy that you're exploring or experimenting with. A contributed talk can even be a *panel discussion*! We need MEMBERS to fill the programs of our meetings with interest, passion, and mathematics. Don't be shy! Talk to your Program Chair today!

(Disclosure: Your Program Chair is also the Seaway Current editor, Elizabeth Wilcox. You can email her at elizabeth.wilcox@oswego.edu or snag a quiet moment at the next meeting.)

# HELP WANTED

- **Are you a member of the AMS? Do you attend AMS section or national meetings?**

  The Seaway Current editor is looking to appoint at least one "AMS Reporter" to write brief reports to the Seaway Section about local AMS section meetings and events, as well as national AMS meetings and news. Check in with Elizabeth Wilcox to volunteer!

  *Qualifications*: Involvement with the AMS. The ability to write an email to elizabeth.wilcox@oswego.edu. The ability to press "Send" with gusto and confidence!

- **Do you attend the Joint Math Meetings on a regular basis? Or even semi-regularly?**

  The Seaway Current editor seeks to engage several "JMM Writers" to submit hightlights of their experience at the JMM, either to the editor directly or to the Seaway Section's Facebook group – to share the experience with those members of the section who can't attend! Even a series of meetings can be exciting when you're not the one attending!

  *Qualifications*: The ability to go to the JMM, either in person or in electronika. The ability to write an email to elizabeth.wilcox@oswego.edu *or* post on a Facebook group. Mastery of #s. The ability to control fear and apprehension of "Big Data Brother."

- **Do you regularly go to the MAA MathFest? Do you return home afterwards, eager to chat about the experience with family and friends who just don't want to hear about *another* math conference?**

  The Seaway Current editor wants to hear! Tell her all about it in a "brief" – and in return, you'll always have an enthusiastic audience.

  *Qualifications*: MAA MathFest attendance, either in person or in electronika. The ability to summarize a multi-day event into a short blurb and respond to editor-suggested edits without heartbreak. The ability to write an email to elizabeth.wilcox@oswego.edu. The ability to press "Send" without regret!

- **Do you like to write?**

  The Seaway Current editor aspires to secure interesting, well-written articles for the Seaway Current to publish. Submit something today!

  *Qualifications*: Membership in the Seaway Section. The ability to write an email to elizabeth.wilcox@oswego.edu or "snail mail" like The Olds do. Willingness to see your message through to publication.

# Reports & Minutes Since Fall 2018

1. Treasurer's Report – Spring 2019
   Gary Towsley, Seaway Section Treasurer

| | | |
|---|---|---|
| Balance as of 9/15/2018 | | $16,914.97 |
| Fall Meeting at Univ. of Toronto Mississauga | | |
| Meeting Receipts - Meeting Expenses | $1,192.34 | |
| Speaker Expenses | ($887.70) | |
| Net | | $304.64 |
| MAA Subvention | | $1,079 |
| Distinguished Lecturer Program | | ($910.49) |
| Prepaid Spring Meeting Registration ($156 - $3.32 PayPal fee) | | $152.68 |
| Balance as of 2/15/2019 | | $17,540.80 |

2. Report from the Chair of the Section – Spring 2019
   Jonathan Cox, Section Chair

   I recently served on the MAA Task Force on Support for Sections, which compiled its final report last month. I learned that other sections tend to struggle with the same issues we do. There is reason to hope that the MAA will enhance efforts to help sections address these issues in the near future. I also heard intriguing perspectives and ideas from other sections. For instance, did you know that the MAA assists some sections in running all their elections electronically, not just the one for representative?

   One concern which surfaced repeatedly and forcefully in our discussions was the need for better communication – from, with, and facilitated by the MAA. The MAA must clearly explain to members what it does and how it benefits them. What services are available? Streamlining the system for sending emails to section members was perhaps the most pervasively-indicated priority in our surveys. Many ways in which the MAA could serve as catalyst for communication among sections, as well as between sections and other groups such as SIGMAAs were also proposed. This extended to helping with logistics of arranging joint regional meetings and publicizing such meetings. There was enthusiastic support for the addition of a business/industry/government (BIG) speaker program similar to the current section visitor and lecture programs. Another priority for sections is support for increasing and diversifying participation in section meetings. They are looking for ways to encourage more involvement by college students, non-tenure-track faculty, and underrepresented groups, as well as from two-year colleges, K-12 schools, and the business, industry and government sectors. I believe the Seaway Section is leading the way on tackling this goal by implementing half-price registration for K-12 teachers, two-year college faculty, adjunct instructors, and retirees as of this spring's meeting. Finally, there is a belief that Americans with Disabilities Act (ADA) compliance at meetings will become a more significant factor in the near future. Sections would appreciate guidelines and advice from the MAA in addressing these issues.

   At present, many members of the executive committees are focusing on preparing for the upcoming meeting, which will feature a variety of exciting events. Beyond that, we are considering a couple major initiatives. Development of a standard registration and payment system, which could be transferred and adapted easily from one meeting to the next, is a priority. Let's express our gratitude to Ryan Gantner for not only running an ad hoc committee to investigate the possibilities, but also developing the prototype system many of you used to register for this meeting. Another service being requested by sections is a standardized (yet customizable) electronic registration and payment process orchestrated by the MAA. Once again, we are ahead of the curve. However, if the MAA does roll out such a system, we will need to compare it to ours and determine the best option. One burning question we'd really like answered is whether host institutions can really compel us to run payments through their platforms and bear the accompanying, sometimes burdensome, fees.

   The brightest star on the horizon is our Year of Diversity theme for 2019-2020. Highlights will include a special speaker and a faculty panel in the fall and a student poster session next spring.

Overall, the state of the Seaway Section is strong, activity and engagement are healthy, and events are diverse. My interactions with other sections continue to increase my conviction these attributes of our section exceed the typical. And, from the afternoon of April 6 onward, we will continue our journey toward new horizons under the capable leadership of Cheryl Miller.

*Respectfully submitted,*
*Jonathan Cox (State University of New York at Fredonia), Seaway Section Chair*

3. THE EXECUTIVE COMMITTEE MEETING – October 12, 2018

*Present: Jonathan Cox, Charlie Ragozzine, Elizabeth Wilcox, Cheryl Chute Miller, Steve Kilner, Gary Raduns.*

Minutes were accepted with editorial corrections and a correction to the statement on credit card fees – the amount indicated is the fees paid for payment processing, not the amount collected via credit card payments.

The treasurer's written report was reviewed and accepted.

Section Representative's Report.

Charlie reviewed his written report (see the Seaway Current). Discussion of his report included observations related to the plan for the MAA to no longer participate in organization of the Joint Mathematics Meetings:

(a) The Congress learned of the change at the same time as the membership of the Association.
(b) The MAA lost about $250,000 per year on JMM.
(c) Questions about the impact of this change on the role of JMM in job searches and faculty recruitment.
(d) This sends an implicit message that "We don't belong together."

The Executive Committee also expressed its concerns over the Association's e-mail policies including the delays between submitting email distribution requests and their delivery and the do-not0send list.

Secretary's Report: Nothing additional to report.

Two-year College Representative's Report: Nothing to report.

Program Chair's Report:

Elizabeth reported 65-70 have registered for the banquet tonight with a total of about 90 for the conference. So far, everything seems to be running smoothly; however, we only have six faculty-contributed talks at this meeting.

Chair's Report:

Jonathan reports that he has been appointed to an MAA Task Force on Support for Sections. Officers suggested that the Association facilitating credit card payments for section meetings could be helpful.

Chair encourages that the local organizer checklist state that meal options must include vegetarian and that caterers should be able to accommodate vegan requests or other dietary restrictions.

The Executive Council discussed mileage reimbursement for the Seaway Distinguished Lecturer Program.

Chair-Elect Report: Nothing to report.

No Old Business

NEW BUSINESS:

- Motion made and seconded that partial terms served on the Executive Committee not apply toward term limits indicated in the by-laws. The motion passed unanimously on voice vote.
- Motion was made and seconded to recommend to the Section that we establish a half-price registration fee for faculty in the following categories: community college, high school, adjunct, and retired. The motion passed without opposition. During discussion it was also suggested that CTLE credits might be offered to encourage high school teachers to participate.

- Discussion of BIG Event at the Spring 2019 meeting. No formal action required.

The Executive Committee adjourned and moved to the Extended Executive Committee.

*Respectfully submitted,*
*Gary L. Raduns, Jr. (Roberts Wesleyan College), Seaway Section Secretary*

4. THE EXTENDED EXECUTIVE COMMITTEE MEETING – October 12, 2018

The Executive Committee (including Gary Towsley) and Jeff Johannes now present.

Minutes of the Spring 2018 Extended Executive Committee were approved with the correction to indicate fees incurred for registrations paid by credit card were up to $400 for this meeting.

Treasurer's Report:

Gary T. noted that meeting revenue and expenses appear much less than typical because most of the finances were handled directly by Brockport prior to turning over funds to the Section. Nevertheless, there is a slight increase in the balance.

Chair's Report:

Chair recapped discussion of meal options and encouraged that future local organizers not include a separate charge for the continental breakfast.

The chair reopened conversation about mileage reimbursement for the Seaway Distinguished Lecturer. The Extended Executive Committee suggests that out of the amount budgeted for the distinguished lecturer, that mileage be paid at the standard federal rate as reimbursed expense and the remainder paid as honorarium.

The chair also reported to the Extended Executive Committee the resolution that partial terms on the executive committee not apply toward term limits.

COMMITTEE REPORTS

Program Committee: Nothing further. The next meeting will be at St. John Fisher College and the speakers are all set.

Speakers for the Fall Meeting at U. of Toronto Mississauga are set: John Mighton (Randolph Lecturer), Dror Bar-natan (Friday evening), Jeffrey Rosenthal, and Brian Forrest. Ryan Gantner will lead the IBL Special Session.

Randolph Lecture Committee: The Randolph Lecture will be delivered at this meeting by John Mighton. The committee will begin its work to identify the Randolph Lecturer for Fall 2020.

Educational Policies Committee: On report that the Executive Committee recommends half-price registration for high school teachers, community college or adjunct faculty, and retirees. The EPC also suggests that the Section may be able to arrange professional development credit for high school teachers.

Distinguished Teaching Award Committee. Keary Howard is now chair of the Section's DTA Committee. He is working with Olympia Nicodemi for her guidance as the call for nominations will be sent out via e-mail soon. The committee had some discussion of fitting the selection to the Year of Diversity.

Nominations Committee: Joe Straight is the current chair (not present). Ryan Gantner reported for the committee that Secretary and Two-Year College Representative are up for election in Spring 2019.

Gehman Lecture Committee: Details were not available, but there is a report that an invitation is or will soon be out for the Spring 2019 meeting.

Seaway NExT: Soliciting suggestions for workshop at the Spring 2019 meeting.

Distinguished Lecturer Committee:

The program is off and running well. The organizers are hearing good reports of the two talks that have been completed to date. Nine schools applied for a visit, the committee selected six of the less involved schools. In

discussion, the Extended Executive Committee reinforced that the priority should be toward those schools that are less involved. The Dist. Lect. Comm. is seeking nominations for the next Lecturer.

The Dis. Lect. Comm. raised a question about committee renewal. Jonathan has assumed that members are serving until 2020 but they may choose their own chair internally and report this to the Executive Committee.

Committee on Website and Registration:
Ryan presented a written report outlining a proposal for online registration and payments. At this point the Executive Committee is willing to try it at St. John Fisher, but not to mandate for future sites.

The Ext. Exec. Comm. also discussed pressing needs for significant updates of the Section web page.

Section Liaison Program: Jeff has made some progress securing new liaisons.

Seaway Current Editor: The most recent issue was out in time for the meeting.

Webmaster: Report that webmaster has limitations on computer time and ability to update the website.

OLD BUSINESS: NONE

NEW BUSINESS:

(a) BIG Event at Spring 2019 Section Meeting. Please help Ryan identify representatives from business, industry or government who are willing to talk about careers or math they do and do not use, to review student resumes, or to conduct mock interviews.
(b) Question: Whether to offer a workshop focusing on writing grant proposals for the MAA's TENSOR Grants.
(c) Section Logo Contest. It is a go.
(d) Section Photo Contest at the Spring 2019 Meeting. Keiko is organizing. Exec. Committee extends a $100 budget. The goal is to increase social media presence and engage students.
(e) Year of Diversity 2019-2020.
(f) MAA Task Force on Support for Sections. Jonathan Cox is a member of this task force. Send suggestions, complaints, etc. to him.
    i. The need for coordinated communication strategies.
    ii. (CR) What is the Association doing in place of the liaison program?

Slides from the MAA Congress meeting are available to officers on the section officers shared Google drive "Meetings."

Adjourned at 6:30 pm.

*Respectfully submitted,*
*Gary L. Raduns, Jr. (Roberts Wesleyan College), Seaway Section Secretary*

5. THE BUSINESS MEETING – October 13, 2018

The Business Meeting convened at around 10:50 am with 17 present.

Minutes of the Previous Business meeting were approved.

Chair, Jonathan Cox reports:

(a) His appointment to the Association's Task Force on Support for Sections.
(b) Policy adopted by the Executive Committee that partial terms do not apply to term limits.

Section Representative, Charlie Ragozzine reports:

(a) Creation of a task force on Support for Sections
(b) A task force to examine the Associations numerous committees (100+)
(c) Congress working on a 5-year strategic plan (non-financial)
(d) The Association experienced a $673K surplus last year. The surplus is attributed to one time proceeds from the book deal with AMS, partnership with Taylor and Francis for journals, an unexpected gift, and good stewardship.
(e) Board of Directors meets 4 times per year, some by video.
(f) Congress Learning Communities (CLiCs) have been formed. Charlie is on the CLiC on Student Activities and

Sections.

(g) The Congress was not involved in the JMM decision. The Association leadership speaks of the savings potentially providing better support to the Sections (e.g. registration and meeting support, expanded Association lecturer opportunities).

(h) The Association is developing a video archive of MathFest plenary talks.

Treasurer's Report:

Balance 3/15/2018: $16877.15

Balance prior to this meeting (10/13) : $16914.97

Program Chair reported on participation at this meeting: 65-70 for the banquet, 80-90 for the conference. Six faculty contributed talks - please encourage your colleagues to speak.

Student Program Committee: No report, but our thanks to Blair Madore for hosting the game show last night. Also note the BIG Event at the Spring Meeting at Saint John Fisher College.

Randolph Lecture Committee: The committee thanks to John Mighton for a fantastic lecture this morning. The committee will soon be getting to work selecting the Randolph Lecturer for Fall 2019 and is excited to work toward the Year of Diversity theme.

Gehman Lecture Committee: The committee is in the process of confirming a speaker for the Spring meeting.

Educational Policies Committee: Reports the proposal to offer half-price registration to high school, community college, adjunct, and retired faculty. We are beginning to explore offering CTLE for high school teachers at Section Meetings.

Distinguished Teaching Award Committee: New chair Keary Howard and former chair Olympia Nicodemi have been in conversation. Please encourage nominations.

Nominations Committee: We will be electing Two Year College Representative and Secretary at the Spring meeting.

Liaison Coordinator (Jeff Johannes): If you don't know who your liaison is, see Jeff. Otherwise, it is working.

Seaway NExT: The committee is looking at ideas for the Spring Seaway NExT Workshop.

Distinguished Lecturer Committee: The committee is seeking nominees for the Seaway Section Distinguished Lecturer for 2019-2020.

Committee on Website and Registration (ad hoc) gave a brief report on the recommendation to create a shell for online registration and payment that can be shared with local organizers and easily reset from meeting to meeting.

Webmaster: no report.

Public Information Officer: Look for us on Facebook (Instagram may be coming soon). Post-Comment-Like. Also, watch for a Logo contest leading into the Spring meeting.

Action Items:

At the recommendation of the Executive Committee, the members at the Business meeting approved the creation of a registration category for K-12 teachers, community college faculty, adjunct faculty and retired faculty to receive half-price registration.

In concluding, the chair announced the Year of Diversity theme for 2019-2020.

The business meeting adjourned at 11:15.

*Respectfully submitted,*

*Gary L. Raduns, Jr. (Roberts Wesleyan College), Seaway Section Secretary*

# Special Events

## Spring 2019 MAA Seaway Section Meeting

### Seaway NExT: "Flipped Learning Workshop"

Saturday, 2 pm - 5 pm

Joe Petrillo of Alfred University will host a workshop on flipped classroom pedagogy in practice. To register, contact Nathan Reff (nreff@brockport.edu).

*Abstract:* Flipped learning is the process by which the transmission of course information occurs before the class meeting. Students spend class time developing their understanding while the teacher provides support and guidance. This Flipped Learning Workshop will provide justification and motivation for considering a flipped-learning approach, step-by-step guidance on how to get started, and a breadth of resources through which teachers can customize an approach for their individual abilities and needs.

### Game Show

Friday, after the banquet lecture

Blair Madore of SUNY Potsdam and the Student Program Committee will host a game show. All (students and faculty) are welcome to participate. There will be camaraderie, mathematics, and prizes!

### Workshop on Leadership in the Mathematical Sciences: "Pre-Tenure and Post-Tenure Faculty Evaluation"

This workshop, the latest installment in a 10-year series, is hosted by Mihail Barbosu, RIT.

### BIG Event!

- Math Careers Panel
- Resume and Interviewing Workshop

*Please bring a resume, if one is prepared, to have it evaluated by potential employers.*

### "A Uniform Geometry for High School, University, and Theoretical Mathematics"

David M. Clark, SUNY New Paltz, hosts a presentation on unifying geometry across educational levels.

*Abstract:* This talk will present a single formulation of Euclidean geometry that is rooted in high school mathematics, can be taught at a deeper level to pre-service high school teachers in colleges and universities and that has a full foundation at the research level. Building this formulation began by looking at what high school students most need from geometry. It then offered a college geometry course for pre-service teachers to prepare them to meet those needs. Finally a mathematically complete version of this same geometry is now being written to support university instructors of those teachers.

# Special Events

## Spring 2019 MAA Seaway Section Meeting

### "Let's Chat about I.L."

Olympia Nicodemi, SUNY Geneseo

A liberal arts education is best when its students can integrate knowledge across disciplinary boundaries so as to see issues, problems, and potential solutions addressed from multiple viewpoints and with a variety of skills. Many of us have had experiences implementing integrative learning (I.L.) opportunities for our students. Let's spend some time talking about how we have done so (or hope to do so) and what the hurdles might be. This will be a session with no formal "talk" but rather a chance to share and learn from each other.

### "Student Learning and Success in Entry-level Mathematics:

*Math Pathways, Corequisite Instruction, and Mathematics Learning by Inquiry"*

William Jaco, Oklahoma State University

*Abstract:* We will facilitate a discussion of the program led by the Oklahoma State Regents for Higher Education to enhance student learning and success in mathematics across Oklahoma. We will discuss the structures of Math Pathways (to Completion) and Corequisite Instruction (at Scale) that are being implemented at all public institutions of higher education across Oklahoma, taking a closer look at these structural changes at Oklahoma State University. While these structural changes are not easy, they are fairly straightforward and from them we are seeing measurable successes. However, a consequence of these changes and the need to address the Task Force Goals for enhanced student engagement, increased applications of mathematics and support for academic success skills dictate necessary classroom instructional changes that will require a shift in departmental culture and faculty and advisor professional development. The newly funded Mathematics Inquiry Project is a statewide program to address these challenging changes. Pilot projects are showing excellent success.

### Evening Workshop: "Pieces of IBL -- how to implement elements of Inquiry-Based Learning"

Saturday, 4:30 pm - 7:30 pm

Rich Spindler (SUNY Plattsburgh) and Matt Thomas (Ithaca College) will host this IBL workshop; dinner is provided, complements of the Upstate New York IBL Consortium.

*Abstract:* There are plenty of reasons why you might not want a class to be entirely IBL-based. There might be particular courses, semesters, or groups of students where you'd like to moderate the use of inquiry-based methods. In this workshop, we'll discuss ways that you could implement (or have implemented) pieces of IBL or IBL-like activities. All are welcome - whether this is your first time trying IBL and want to get your feet wet before diving in, or a seasoned IBL users who might not want a particular class to be entirely IBL. All current or future educators are particularly welcome to intend.

# Contributed Talk Schedule

## Spring 2019 MAA Seaway Section Meeting

**Basil 200**

11:30-12:25 **David M. Clark** (SUNY New Paltz), *A Uniform Geometry for High School, University, and Theoretical Mathematics* (special presentation)

1:45-2:40 **William Jaco** (Oklahoma State University), *Student Learning and Success in Entry-level Mathematics: Math Pathways, Corequisite Instruction, and Mathematics Learning by Inquiry* (workshop)

2:45-3:10 **Christopher Beam** (RIT), *State Estimation for Cardiac Action Potential Dynamics: A Comparison of Linear and Nonlinear Kalman Filters*

**Basil Hall, Math Center**

1:45 - 2:40 **Mihail Barbosu (**RIT), *Workshop on Leadership in the Mathematical Sciences: Pre-Tenure and Post-Tenure Faculty Evaluation* (workshop)

**Basil 211**

11:30-11:55 **Philippe Savoye (**Mansfield University), *Introducing Students to Discrete-Time Problems in Differential Equations Classes*

12:00-12:25 **Yozo Mikata** (Fluor Corporation), *1D Phononic Metamaterials: Shear Waves*

1:45-2:10 **Sedar Ngoma** (SUNY Geneseo), *On a space-dependent inverse source problem for a parabolic equation*

2:15-2:40 **Ahmad Almomani** (SUNY Geneseo), *A Modification Particle Swarm Optimization for Non-Differentiable Test Problems*

2:45-3:10 **Marvin Gruber** (RIT), *Inverse Problems, Tikhonov Regularization and Ridge Regression*

**Basil 214**

11:30-11:55 **Bryan Goldberg** (SUNY Albany), *Complex Dynamics on the Projective Spectrum of the Infinite Dihedral Group*

12:00-12:25 **Jack Graver** (Syracuse University), *Is the equation* $\dim(\mathcal{S}) + \dim(\mathcal{S}^{\perp}) = \dim(\mathcal{V})$ *valid for general inner products over an arbitrary field?*

1:45-2:10 **Robert Sulman (**SUNY Oneonta), *Linear Functions (modulo n)*

2:15-2:40 **Ian Alvery (**University at Rochester), *Renormalizable Rectangle Exchange Maps*

2:45-3:10 **Aaron Heap** (SUNY Geneseo), *Space-Efficient Knot Mosaics*

**Basil 216**

11:30-11:55 **Robert Rogers** (SUNY Fredonia), *Stop teaching the Chain Rule (and still teach Calculus)*

12:00-12:25 **Marlo Brown** (Niagara University), *Analysis of an Activity in Elementary Statistics*

1:45-2:10 **Likin Simon Romero** (Alfred University), *Using Board Games in an Inquiry-Based Learning Group Theory Class*

2:15-3:10 **Olympia Nicodemi** (SUNY Geneseo), *Let's chat about I.L.* (discussion)

# Student Presentation Schedule

## Spring 2019 MAA Seaway Section Meeting

**Basil 205:**

11:30-11:55 **James F. Clark** (SUNY Albany), Expanding on the Unrolled Quantum Group of $\mathfrak{sl}_2$
12:00-12:25 **Amy Huddell** (Houghton College), *Exponential Domination in Directed Graphs*

1:45-1:57 **Nicholas Lynn** (St. Lawrence University), *How to Pick a Winner*
2:00-2:12 **Emel Abid** (SYNY Geneseo), *Modeling the AIDS Epidemic in Southern Africa using an SEIID Model*
2:15-2:27 **Seongwon Im** (St. Lawrence University), *Are there Racist Soccer Referees?*
2:30-2:42 **Molly Marshall** (SUNY Geneseo), *Standing in a Room of Mirrors*
2:45-2:57 **Eliza Oliver** (St. Lawrence University), *Using the Prisoner's Dilemma to Understand the Spread of Prejudice*
3:00-3:12 **Clayton Coonrod** (Utica College), *Age Specific Population Growth Models*

**Basil 206:**

11:30-11:55 **Jason LaRuez** (RIT), *Roles of elasticity and inertia in polymer flows around a sharp bend – A Systematic Mesh Refinement Study*
12:00-12:25 **Benjamin Oltsik** (Hamilton College), *Eta-Quotients of Prime or Semiprime Level*

1:45-1:57 **Colin Wilcox** (SUNY Geneseo), *Modeling feral cat population control practices to combat transmission of T. gondii to Hawaiian monk seals*
2:00-2:12 **Cameron Dehais** (St. Lawrence University), *Nickelodeon Fan Polls under Various Voting Methods*
2:15-2:27 **George Kuliner** (SUNY Geneseo), *Hybrid Particle Swarm Optimization: Two Approaches using Implicit Filtering*
2:30-2:42 **Connor Fulk** (St. Lawrence University), *Racial Bias in U.S. Prison Sentencing*
2:45-2:57 **Gregory Vinal, Jr.** (SUNY Geneseo), *Realizing the Symmetries of a Group*
3:00-3:12 **Gregory Vinal, Jr.** (SUNY Geneseo), *Space-Efficient Knot Mosaics of Size 7*

**Basil 207:**

11:30-11:55 **Kyler Anderson** (SUNY Oswego), *Constructing the Heptadecagon*
12:00-12:25 **Danny Akimchuk** (Ithaca College), *Patterns Among Rational Squares: Real and Complex*
1:45-1:57 **Bridget Bruen** (SUNY Geneseo), *Modeling of the implication of edible cutlery at SUNY Geneseo*
2:00-2:12 **Michael Khaimraj** (SUNY Fredonia), *Surface Volumes in 4 Dimensions*
2:15-2:27 **Nikauly Casilla** and **Stephanie Alvarez Merlos** (SUNY Geneseo), *Applications of Differential Equations Models to Sustainability*
2:30-2:42 **Samantha C Woughter** (SUNY Fredonia), *Avocado's Number*
2:45-2:57 **Elisabeth Howard** (Hamilton College), Classifying $p$-adic Fields of Degree $p^2$
3:00-3:12 **Jamie Woodworth** (Ithaca College), *Egyptian Expressions: Past and Present*

**Basil 208:**

11:30-11:42 **Heetisha Inderjeet** (Ithaca College), *Even-sided Magic Polygons*
11:45-11:57 **George Clapper** (SUNY Geneseo), *The theory behind the Lagrangian*
12:00-12:12 **Francisco A. Rodriguez-Tineo** (St. Lawrence University), *Prison Gerrymandering*
12:15-12:27 **Ian Quinn** (SUNY Geneseo), *R-file of Thistle Dispersal Converted into MatLab-file*
1:45-1:57 **Florence R LaPlaca** (SUNY Fredonia), *The Importance of Math in Scientific Research as Seen Through Microplastic Pollution*
2:00-2:12 **Ean Costello** (SUNY Geneseo), *The Math Behind Constructing Hyperbolic and Spherical Kaleidoscopes*
2:15-2:27 **Megan J Ott** (SUNY Fredonia), *An Exploration into the Symmetries of Platonic and Archimedean Solids*
2:30-2:42 **Bilal Mustafa** (Hamilton College), *A Look At Regularization*
2:45-2:57 **Elizabeth Faxlanger** (Niagara University), *Planning for Retirement: The Doors Financial Literacy Can Open*

**Basil 209:**

11:30-11:42 **Jonathan McCart** (SUNY Geneseo), *New Criteria for Comparing Global Stochastic Derivative – Free Optimization Algorithms*
11:45-11:57 **Travis Marnell** (St. Lawrence University), *How Math is Solving the Issue of Gerrymandering*
12:00-12:12 **Eric Koessler** (SUNY Geneseo), *Hybridization of Particle Swam Optimization and Pattern Search Algorithms*
12:15-12:27 **Xizhao Liu** (St. Lawrence University), *Robinson or Doyle? Authorship attribution for "The Hounds of The Baskervilles"*
1:45-1:57 **Alex Hepburn** (SUNY Plattsburgh), *Bird Migration Modeling*
2:00-2:12 **Sam Haney** (Ithaca College), *8 Triangles, 2 Squares*
2:15-2:27 **Keigan Case** (Ithaca College), *Pascal-like Triangles Formed from Powers of n and $n^{th}$ Factorials*
2:30-2:42 **Claire Canner** (RIT), *Iterations of a Modified Sisyphus Function of Order 3*
2:45-2:57 **Sam Factor** (Ithaca College), *Do Your Initial Expectations and Goals in a College Course Relate to Your Final Grades?*
3:00-3:12 **Emily Viehl** (St. Lawrence University), *Creating a Content Based Book Recommendation System Using Sentiment Analysis, Stylometry, and Topic Modeling*

**Basil 210:**

12:00-12:25 **Genevieve Rowe** (SUNY Geneseo), *M.C. Escher: Symmetry in Art*
1:45-1:57 **Benjamin Parfitt** (Hamilton College), *The Baire facts about the real line and beyond*
2:00-2:12 **Tomoki Noguchi** (SUNY Plattsburgh), *Random Walker Study*
2:15-2:27 **Ryan Tamburrino** (Hamilton College), *Eigenvector Centrality in the Context of Board Games*
2:30-2:42 **Elizabeth Andrews** (SUNY Oswego), *Julia Robinson's Life and Work Regarding Hilbert's Tenth Problem*
2:45-2:57 **Emily Strong** (St. John Fisher College), *Distinguishing Resource Selection from Heavy-Tailed Dispersal in Spatial Epidemic Models*
3:00-3:12 **Juliann Geraci** (SUNY Oswego), *The Hidden Information in Infinite Series Arising From Graphs*

**Basil 200**

11:30-12:25 **David M. Clark** (SUNY New Paltz), *A Uniform Geometry for High School, University, and Theoretical Mathematics* (special presentation)

1:45-2:40 **William Jaco** (Oklahoma State University), *Student Learning and Success in Entry-level Mathematics: Math Pathways, Corequisite Instruction, and Mathematics Learning by Inquiry* (workshop)

2:45-3:10 **Christopher Beam** (RIT), *State Estimation for Cardiac Action Potential Dynamics: A Comparison of Linear and Nonlinear Kalman Filters*

# Poster Session

Basil Hall, Golisano Gateway 12:00-12:20

Eva Balasi (SUNY Brockport), *Prime numbers between sum of of divisors*
Xaire Davis (SUNY Brockport), *Differences of Prime Numbers*
Amber Day (SUNY Brockport), *Comparing differences of consecutive prime numbers*
Courtney Hauf (SUNY Brockport), *Variations of the Gersgorin Circle Theorem*
Henry Huang (RIT), *Role of polymer branching on the development of an elastic instability in cross-slot flow*
Michele Iannone (SUNY Brockport), *Japanese Garden*
Jennifer Johannes (SUNY Brockport), *Averaging the prime number distribution*
David Knausdorf (SUNY Brockport), *Estimating the sum of the reciprocal of primes*
Una M. MacDonald (SUNY Brockport), *The minimum of some functions of integers*
Anthony A. Manning (SUNY Brockport), *Estimating Quotients of Consecutive Primes*
Brooke Matacale (SUNY Brockport), *Differences of Roots of Consecutive Prime Numbers*
Jared B. McComb (SUNY Brockport), *Differences of Small Powers of Consecutive Primes*
Alexa Miles (SUNY Brockport), *Minimum of Some Differences of Cubes*
Briana Palmer (SUNY Brockport), *Quotients related to the prime number distribution*
Oana Prajitura (SUNY Brockport), *Matrices with Oscillating Orbits and Rough Sensitivity to Initial Conditions in a Finite Dimension*
Walter Savidis (SUNY Brockport), *Differences of quotients of consecutive primes*
Morgan Sherwood (SUNY Brockport), *Differences of Roots of Products of Consecutive Primes*
Matthew Too (SUNY Brockport), *The use of mean value theorem in number theory*
Elizabeth Waye (SUNY Brockport), *Completing the Gauss Lucas theorem*

# Abstracts for Contributed Talks

## Spring 2019 MAA Seaway Section Meeting

1. **Ahmad Almomani** (SUNY Geneseo)

*A Modification Particle Swarm Optimization for Non-Differentiable Test Problems*

Particle Swarm Optimization (PSO) has introduced by studying the social behavior that implemented rules using distance matching velocity and acceleration of the particles to get swarming behavior in groups of simple agents. But the uncontrolled increase of the velocities values leads to swarm explosion and the sensitivity of the parameters modifications that may profoundly change the convergence of the algorithm.

In this talk, a new modification for Particle Swarm Optimization (PSO) algorithm is proposed and applied on very well-known non-differentiable benchmark problems where we cannot use any derivative based method. This modification produces high reliability, cost, and robustness of PSO. This approach depends on the update after each iteration for the position and velocity that maximize the diversity between all swarm individuals.

2. **Ian Alvery** (University at Rochester)

*Renormalizable Rectangle Exchange Maps*

A domain exchange map (DEM) is a dynamical system defined on a smooth Jordan domain which is a piecewise translation. We explain how to use cut-and-project sets to construct minimal DEMs. Specializing to the case in which the domain is a square and the cut-and-project set is associated to a Galois lattice, we construct an infinite family of DEMs in which each map is associated to a PV number. We develop a renormalization scheme for these DEMs which we use to study the ergodic properties of these maps. Finally we explain how to compose some of these maps to create multistage, renormalizable DEMs.

3. **Marlo Brown** (Niagara University)

*Analysis of an Activity in Elementary Statistics*

In the elementary statistics course, I motivate the concepts of probability, the central limit theorem and confidence intervals by having the students roll a pair of dice. But how accurate is this? This talk will explore the mathematics behind the activity.

4. **Bryan Goldberg** (SUNY Albany)

*Complex Dynamics on the Projective Spectrum of the Infinite Dihedral Group*

Using the self-similarity of the infinite dihedral group ( $D_\infty$ ) in *Joint Spectrum and the Infinite Dihedral Group*, Grigorchuk and Yang defined a mapping *F*: $\mathbf{C}^3 \sim\!\!\rightarrow\!\!\sim \mathbf{C}^3$ where

$$F(z) = (z_o\left(z_0^2 - z_1^2 - z_2^2\right),\ z_1^2 z_2,\ z_2\left(z_0^2 - z_2^2\right).$$

After establishing some background on *F(z)* we'll use complex dynamics to establish some properties of this mapping. We'll use equivalent projective space and look at *F*: $\mathbf{P}^2 \rightarrow \mathbf{P}^2$ to discuss some results including the Fatou and Julia sets of *F(z)* restricted to the projective spectrum. We'll conclude by examining connections between spectral theory and dynamics in this particular situation. This is joint work with Rongwei Yang.

5. **Jack Graver** (Syracuse University)

*Is the equation* $\dim(\mathcal{S}) + \dim(\mathcal{S}^\perp) = \dim(\mathcal{V})$ *valid*

*for general inner products over an arbitrary field?*

Let $\mathcal{V}$ be a finite dimensional vector space over the field $\mathbb{F}$.. By an inner product, we mean a nonsingular, symmetric, bilinear form. Over the reals the symmetric bilinear form is usually required to be positive definite, which makes no sense over most fields. Here positive definite is replaced by the much weaker condition of nonsingularity: the only vector orthogonal to every vector in $\mathcal{V}$ is the zero vector. The usual bilinear form, summing the pairwise products of the coordinates, is an inner product in this sense over $\mathbb{F}$., for any field $\mathbb{F}$.. The usual proof, over the reals, of this dimension theorem is no longer valid in this general setting. The problem is that there may well be non-zero vectors orthogonal to themselves. When a subspace $\mathcal{S}$ contains such vectors, the subspace $\mathcal{S} \cap \mathcal{S}^\perp$ may well have positive dimension and so, $\mathcal{V}$ is no longer a direct sum of $\mathcal{S}$ and $\mathcal{S}^\perp$. For a simple example, consider a finite set ***X***. With Boolean sum $(A + B = A \cup B - A \cap B)$ and the obvious scalar multiplication by scalars in the field $\mathbb{Z}_2$ , the set of subsets of ***X*** is an |***X***|-dimensional vector space over $\mathbb{Z}_2$ . One easily checks that it admits the inner product defined by $\langle A, B\rangle = |A \cap B|_{mod2}$ . Let ***X***={a,b,c,d} and let $\mathcal{S}$ be the 2-dimensional subspace with vectors $\emptyset$ ,{a,b},{c} and {a,b,c}. One easily checks that $\mathcal{S}^\perp$ is the 2-dimensional subspace with vectors $\emptyset$, {a,b}, {d} and {a,b,d}. It follows that $\mathcal{S} \cap \mathcal{S}^\perp$ is the 1-dimensional subspace consisting of the vectors $\emptyset$ and {a,b}. At least in this example, $\dim(\mathcal{S}) + \dim(\mathcal{S}^\perp) = \dim(\mathcal{V})$ still holds. But, is it always valid and, if it is, can we prove it?

6. **Marvin Gruber** (RIT)

*Inverse Problems, Tikhonov Regularization and Ridge Regression*

Let X and Y be two spaces where the elements of X are unknown and the elements of Y are known or available. Let T be a mapping from X to Y. Solving an inverse problem consists of finding elements $x \in X$ such that $Tx = y$ where $y \in Y$. Two examples of inverse problems are:

1. When X and Y are Hilbert spaces and T is a linear transformation between them;
2. Fitting a linear regression model given a data set.

The inverse problem in 1 above is well posed if:

1. there exists one solution x;
2. the solution x is the only solution;
3. the solution x depends continuously on y.

When one or more of the three conditions above does not hold the problem is ill-posed. For an ill-posed problem a small change in y might mean a large change in x.

Consider a linear model of the form $Z = W\beta + \varepsilon$ where Z is a vector of observations of a variable that depends on a matrix of fixed values W or observations of one or more variables. The problem here is finding a vector of $\beta$ coefficients that gives an appropriate fit of the model.

For data where there are high correlations between some the W variables (multicollinear data) the least square estimator can have very high variability. One way to solve the first problem is Tikhonov regularization. A possible solution to the second problem is to use ridge regression estimators. Ridge regression is Tikhonov regularization for the finite dimensional case. As might be expected many of the ideas and concepts that pertain to these two problems and their solutions are very similar. The goal of the talk is to compare and contrast them.

7. **Aaron Heap** (SUNY Geneseo)

*Space-Efficient Knot Mosaics*

Knot mosaics, which are representations of knot diagrams on a square array created using tiles chosen from a specific list of eleven mosaic tiles, were first introduced by Lomonaco and Kauffman in 2008. They introduced the mosaic number of a knot, which is the smallest size mosaic on which the knot can be represented. We introduce the concept of a space-efficient knot mosaic, which uses the least number of non-blank tiles necessary to depict the knot. This least number is called the tile number of the knot. In this talk, we will discuss these introductory concepts, provide strict bounds for the tile number of a knot in terms of the mosaic number of the knot, and give a complete list of prime knots with mosaic number six or less. Knot mosaic theory is a great source of research projects that are accessible to undergraduates, and we will discuss a few of these unanswered questions.

8. **Yozo Mikata** (Fluor Corporation)

*1D Phononic Metamaterials: Shear Waves*

Metamaterials have been studied extensively since Pendry and Holden (1999), and Smith et al. (2000) have succeeded in creating an electromagnetic composite material (photonic metamaterial) with negative permeability and negative permittivity in certain frequency range (double negative materials). But the original concept goes back to a theoretical paper by Veselago in 1967. In this talk, binary and ternary 1D phononic metamaterials will be discussed in relation to local resonance. Particular attention will be focused on the effect of the geometrical parameters of the material periodicity on the dispersion characteristics of shear (SH & SV) waves. Both infinitely layered material and finitely layered material will be considered. For infinitely periodic materials, dispersion relations will be obtained, and for finitely periodic materials, transmission coefficients will be discussed. The effect of the incidence angle will be also discussed.

9. **Sedar Ngoma** (SUNY Geneseo)

*On a space-dependent inverse source problem for a parabolic Equation*

We consider an inverse source problem for a parabolic partial differential equation in which the source function depends only on the space variables in a domain $\Omega$ of $\mathbf{R}^d$, $d \geq 1$. To recover this source function, the equation is subject to an integral constraint and the final time overdetermination. We show the existence, uniqueness, and stability of classical solutions in Hölder spaces. Our numerical scheme uses a finite element discretization in space to approximate the solution of this inverse problem. The numerical results and the error reported show the accuracy of our approximation.

10. **Robert Rogers** (SUNY Fredonia)

*Stop Teaching the Chain Rule! (And Still Teach Calculus)*

Did the title catch your attention? How many of your calculus students struggle with the chain rule? This talk will demonstrate that by focusing on differentials rather than derivatives, the chain "rule" can be replaced by the broader and more natural technique of substitution. We will also see how topics such as related rates and implicit differentiation become more natural when focusing on differentials. We will look at how this affects the multivariable calculus chain rule as well.

11. **Simon Romero** (Alfred University)

*Using Board Games in an Inquiry-Based Learning Graph Theory Class*

When teaching Mathematics, it is often overlooked how barren the presentation of concepts are. The "User-Interface" when teaching Mathematics could be one of the reasons for the lack of interest of some of our students. In particular, one of the problems of teaching a Graph Theory (to non-Mathematics majors) is the amount of terminology, concepts and methodology that students need to assimilate in a short period of time. The presenter has taught a Graph Theory class where board games are used to ease the barrier of entry previously described. The games used, class structure and the experiences will be presented.

12. **Philippe Savoye (**Mansfield University)

*Introducing Students to Discrete-Time Problems in Differential Equations Classes.*

Many benefits can be obtained by illustrating how commonly taught methods in introductory ordinary differential equations courses can be extended to discrete-time problems. The method of undetermined coefficients, for example, can be adapted to solve non homogeneous difference equations. Similarly, the use of the $z$-transform as a tool in solving discrete-time initial value problems can be developed in parallel with the Laplace transform. Incorporating these topics prepares students to examine issues arising in modern signal processing applications.

# Student Talk Abstracts

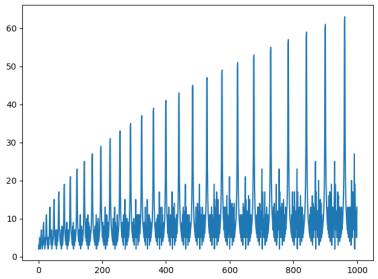
**Emel Abid, SUNY Geneseo**

*Modeling the AIDS Epidemic in Southern Africa using an SEIID Model*

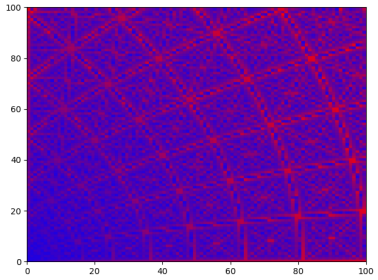
Abstract: Sub-Saharan Africa accounts for approximately 70% of all reported cases of HIV and 74% of all AIDS-related deaths worldwide. We created a compartment model utilizing a system of differential equations to simulate the spread of HIV through a population while varying the rate at which people a re diagnosed and the rate at which people change their behavior. As an individual becomes aware of their condition, we are assuming that this individual will partake in safer behaviors to avoid spreading the disease. This simulates the implementation of a program allowing individuals to be diagnosed and informed of safer sexual behaviors in the Sub-Saharan community. We also use a preferential attachment network model to more realistically test the spread of HIV through a population of individuals with a varying number of connections to other individuals. Over time, the rate of people being infected decreases substantially. By varying the rate at which people are diagnosed over multiple iterations, the disease becomes less prevalent in the population as the rate of diagnosis is increased. This study should be helpful for organizations designing an intervention program to minimize HIV infection.

**Danny Akimchuk, Ithaca College**

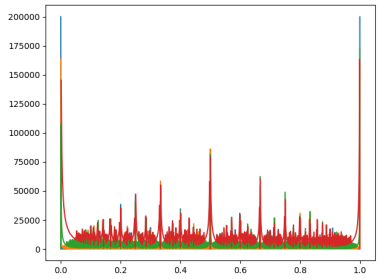
*Patterns Among Rational Squares: Real and Complex*




(a) The graph of $\sigma(n)$.




(b) The graph of $\kappa(z)$.




(c) Self similarity of the graph of $\sigma(n)$ under renormalization.

Abstract: As the rational numbers are dense in the real numbers, so is the set of their squares. However, when ordered by their denominators, the rational squares exhibit behavior full of patterns. We consider the sets of rational squares with a specific denominator, $Q_q^2 = \left\{ \left(\frac{p}{q}\right)^2 \middle| p \in \mathbb{Z} \right\}$. We explore these sets by defining the function $\sigma(n)$ as the smallest $q \in \mathbb{N}$ such that $Q_q^2 \cap (n, n+1) \neq \emptyset$. This function, bounded by a square root curve, displays behavior reminiscent of periodic functions. We also extend these objects to the complex numbers by defining $C_q^2 = \left\{ \left(\frac{a+bi}{q}\right)^2 \middle| a, b \in \mathbb{Z} \right\}$ and $\kappa(z)$ as the smallest $q \in \mathbb{N}$ such that $C_q^2 \cap {}_z\square \neq \emptyset$, where ${}_z\square$ is the open unit square in the complex plane with lower left corner $z$. Then, $\sigma(n)$ can be seen as a restriction of $\kappa(z)$ along the real axis. Finally, we explore the fractal-like behavior exhibited by $\sigma(n)$. We find that segments of the seemingly noisy region between any two "peaks" of the graph of $\sigma(n)$ can be stretched to sit directly on top of the the whole region once $n$ gets sufficiently large, displaying self similarity in the limit.

**Kyler Anderson, SUNY Oswego**
*Constructing the Heptadecagon*

Abstract: Can you draw a triangle? How about a square? Can you make them perfect? How about a pentagon? In mathematics, and geometry particularly, constructions are a way of drawing things with mathematical precision, using a straightedge and compass. It comes as no surprise that we can draw a regular triangle and square, but we can also make a regular pentagon and hexagon; the ancient Greeks knew that much. If you can draw a square, you can imagine splitting the sides in half to make an octagon. For over a thousand years after the greeks, that's all we thought we could do: 3, 4, 5, and 6 sides, and any doubling of those. Imagine the surprise of everyone (mathematicians mostly) when Gauss, at only 19 years old, proved we could construct a regular 17−sided polygon. And when Erchinger, shortly later, found an actual construction, Gauss returned the excitement. The excitement would last for scores of years and many more proofs would be found for constructing the heptadecagon. Here we explore a particularly elegant one from Richmond, which employs, in its depths, trigonometry, de Moivre's Theorem, and some clever algebra.

**Elizabeth Andrews, SUNY Oswego**
*Julia Robinson's Life and Work Regarding Hilbert's Tenth Problem*

Abstract: Julia Robinson is one of the most renowned mathematicians of the twentieth century. The first woman elected into the National Academy of Sciences, Robinson's career in mathematics spanned over three decades. Her love for both recursion and number theory as a young college student led her to Hilbert's Tenth Problem, commencing her life's work. It is her conjecture, namely the J.R. Hypothesis, that led to a groundbreaking solution to Hilbert's Tenth Problem, proving her invaluable to the math community. In this talk, not only will I discuss her ingenious hypothesis, but I will also explore some of the key terms and theorems in her work that not only led to her conjecture, but to the eventual solution of Hilbert's Tenth Problem. Furthermore, I will examine her personal life and discuss how her struggles with her health and family tragedy went hand in hand with her career.

**Christopher Beam, RIT**
*State Estimation for Cardiac Action Potential Dynamics: A Comparison of Linear and Nonlinear Kalman Filters*

Abstract: Cardiac arrhythmias are a leading cause of death in the industrialized world. Various technologies, such as electrocardiography, optical mapping, and patch clamping, have been developed to monitor cardiac electrophysiological behavior in live tissue. One limitation is that none of the available measurement methods is capable of monitoring simultaneously all quantities, such as intracellular ionic concentrations and ion-channel gating states, that may be important contributors to arrhythmia formation. To help fill this gap, we tested two state estimation algorithms on the Karma two-variable model, which is a nonlinear differential equation model of cardiac action potential (AP) dynamics. State estimation algorithms allow for reconstruction of dynamical (or state) variables of a system, based on limited measurements, in cases where certain state variables cannot be observed directly. While a number of different varieties of Kalman filter (KF) have been produced since the technique's introduction, to our knowledge no cardiac AP studies have been performed comparing the effectiveness of a traditional, linear KF against that of a newer, nonlinear KF. To that end, we estimated the slow variable of a single-cell Karma model from noise-corrupted measurements of the fast variable, and compared estimates from a linear KF with periodic gain updates against those from a nonlinear filter, specifically the Unscented Kalman Filter (UKF). While the linear filter was able to estimate the state of the model well for longer cycle lengths (CLs), in the range of 800ms, it was outperformed by the UKF for shorter CLs, in the range of 500ms.

**Bridget Bruen, SUNY Geneseo**
*Modeling of the implication of edible cutlery at SUNY Geneseo*

Abstract: In this talk, we will discuss the method for the gradual implication of edible or 100% degradable (should you choose not to eat them) cutlery. I will model this as a logistic model to introduce a rate at which to initiate the purchase of proper cutlery, so it comes at no extra cost to SUNY Geneseo, and reduce the using of plastic cutlery.

**Claire Canner, RIT**
*Iterations of a Modified Sisyphus Function of Order 3*

Abstract: The modified Sisyphus function of order 3 is defined and we determine the smallest nonnegative integer $n$ requiring a specified number of iterations of the function that must be applied to $n$ until the sequence generated by these iterations becomes stable or cycles.

**Keigan Case, Ithaca College**
*Pascal-like Triangles Formed from Powers of n and $n^{th}$ Factorials*

Abstract: As a continuation of a previous student's research, titled "Dawson's Integral, Integral Transformations, and Applications", this research projects seeks to find patterns in a Pascal-like triangle. Unlike the original Pascal's triangle being formed from binomial coefficients, this specific triangle is formed by the coefficients of polynomials formed from higher order derivatives of Dawson's integral.

The pattern in this triangle is that the first entries of each row are powers of $n$ and the last entry of each row is the nth factorial of the row numbers where $n$ is some natural number. This research focuses primarily on the $n = 2$ and $n = 3$ cases, so the triangle would feature 2 raised to the row number and double factorials of row numbers for the $n = 2$ case and 3 raised to the row number and triple factorial of row numbers for the $n = 3$ case. All entries that are not first or last in the row are formed by multiplying the two entries above it then dividing by the number that is two rows above the entry in question. This process is iterative, generating new rows of the triangle.

This project explores the nature of this triangle and its properties, as well as possible applications of its properties. Some of the topics that have been investigated are the sums of rows, sums of diagonal rows in the triangle, patterns in the middle entries of rows, and various other patterns involving occurrences of specific numbers in the triangle.

**Nikauly Casilla and Stephanie Alvarez Merlos, SUNY Geneseo**
*Applications of Differential Equations Models to Sustainability*

Abstract: We will introduce models for first order, second order, linear, and non-linear differential equations. We will show four different models and applications pertaining to sustainability which can be used around Geneseo and our campus. Not only can these models be utilized for short-term improvement on technique for sustainability but also for the long run.

**George Clapper, SUNY Geneseo**
*The theory behind the Lagrangian*

Abstract: For this talk, I will be exploring the different uses of the Lagrangian, named after the French mathematician Joseph-Louis Lagrange. The Lagrangian is often used to model various concepts of energy, and motion in physics. Some topics in Lagrangian mechanics include momentum, both angular and linear momentum. In this talk I will cover the following concepts: The double pendulum, problems in both angular and linear momentum, the transfer of energy, and oscillations. In describing these phenomena, we will be exploring the following concepts: The Euler-Lagrange equations, Noether's Theorem, and various other models that quantify these, for example; The Atwood machine, moving plains, mass in a spring, Cycloidal pendulum, and many others. In this talk, I will show derivations, and applications for these theorems, and equations.

**James Clark, SUNY Albany**
*Expanding on the Unrolled Quantum Group of* $\mathfrak{sl}(2)$

Abstract: In this talk we will be expanding on the representation theory of the unrolled quantum group $\overline{U}_q^H(\mathfrak{sl}_2)$ where $q$ is any primitive root of unity. We will talk about its center, how $\overline{U}_q^H(\mathfrak{sl}_2)$-mod forms a ribbon category, the simple and projective modules forming a subcategory, logarithmic modules, and results that have applications to topological quantum field theory (TQFT).

**Clayton Coonrod, Utica College**
*Age Specific Population Growth Models*

Abstract: In this talk, we will discuss a population growth model which considers the growth rate and reproductive rate for each age class in a population. We show how the eigenvalues of the associated Leslie matrix indicates the growth rate of the population. When the growth rate is positive we may harvest from certain age classes to stabilize growth. We investigate harvesting strategies to obtain the optimal yield.

**Ean Costello, SUNY Geneseo**
*The Math Behind Constructing Hyperbolic and Spherical Kaleidoscopes*

Abstract: Kaleidoscopes are known for being cheap children's toys that show basic symmetrical patterns, but is that all they are? The purpose of this project is to look at more complicated kaleidoscopes and find how they work and how to make them. We will look at the mathematical properties of two different types of kaleidoscopes, hyperbolic and spherical. We will then analyze two homemade examples and then give an explanation of how they were built.

**Cameron Dehais, St. Lawrence University**
*Nickelodeon Fan Polls Under Various Voting Methods*

Abstract: Amid national discourse about voting systems in the United States, Maine's 2$^{\text{nd}}$ Congressional District made history with an election decided by ranked-choice voting. Coupled with a tournament-style series of polls conducted by fans of the television network Nickelodeon, this raises questions as to how voting tabulation methods can sway election outcomes. This paper seeks answers to these questions via original survey data. Through two separate rounds of polling, data were collected to gain insight into Nickelodeon fans' preference of cartoons airing in the 1990s and early 2000s. Multiple distinct tabulation methods are used to count these votes and determine which Nicktoons are fans' definite favorites.

**Sam Factor, Ithaca College**

*Do Your Initial Expectations and Goals in a College Course Relate to Your Final Grades?*

Abstract: In this research project, we were interested in how initial student expectations in a mathematics course at Ithaca College related to their performance in the course. Furthermore, we analyzed how goal setting and perceived ability related to midterm and final grades. In this survey study, over 100 participants across four different Ithaca College mathematics courses were surveyed and their answers were analyzed with their mid-term and final grades. Two main psychological theories were examined in this research; the self-fulfilling prophecy and entity theory. The self-fulfilling prophecy was analyzed be comparing the differences in perceived teacher expectations and student expectations with grades in the math course. More specifically, do students with an entity theorist (fixed) mindset perform worse in their courses? Self-efficacy, the belief that a student had in their ability to do well in the course, was also measured to test how self-efficacy related to academic performance in math courses. Additionally, this study looked at key factors that are known to influence motivation such as quality sleep and eating a healthy breakfast. This correlational research study also examined how having a friend in a math course related to student's performance in the course. Lastly, bi-variate correlations were used to examine the relationship between each item in the survey.

**Elizabeth Faxlanger, Niagara University**

*Planning for Retirement: The Doors Financial Literacy Can Open*

Abstract: This talk examines the importance of retirement savings and financial literacy. A computational algorithm involving the salient features of retirement savings accounts (including age at which a person begins to save for retirement, rate of return, life expectancy, taxation, and more) will be discussed, as well as the implications for financial literacy in students as young as middle school-aged. This work is a supervised Honors Thesis as part of the Honors Program at Niagara University.

**Connor Fulk, St. Lawrence University**

*Racial Bias in U.S. Prison Sentencing*

Abstract: The United States has the world's highest incarceration rate at 670 per $100,000$ people. Also, the United States prison population has been growing since the 1980s. Only 13.4% of the US population is black but 38.0% of US federal inmates are black. In 2008 and 2009, black people received on average sentences that were 35 months longer than sentences received by white people. We examine these disparities by looking at prison sentence length by race for the same crime.

**Juliann Geraci, SUNY Oswego**

*The Hidden Information in Infinite Series Arising From Graphs*

Abstract: Letting $h_n$ denote the number of walks of length $n$ in a directed graph $G$, we study the infinite sequence of numbers $h = (h_0, h_1, h_2, \dots)$, and how properties of $G$ are encoded in its growth. To extract information from $h$, we will study its generating function $H(t) = \sum_{n>0} h_n t^n$. We will show that $H(t)$ coincides with a rational function $f(t)$, and that properties of $G$ (e.g., the number and lengths of oriented cycles in $G$) influence the form of $f(t)$.

**Sam Haney, Ithaca College**

8 *Triangles,* 2 *Squares*

Abstract: The project is an exploration of the various polyhedrons made with 8 equilateral triangles and 2 squares, all having the same side length. For simplicity's sake when any math was done and when we used GeoGebra the side lengths of the polygons were all one unit. Throughout the project we have looked at finding all various polyhedrons that can be made with the 8 triangles and 2 squares. Each unique polyhedron is categorized by how the two squares are positioned in relation to each other in the shape. The categories are defined as the two squares parallel to each other, the two squares sharing a side and coplanar, the two squares sharing a side and creating an obtuse angle, the two squares sharing a side and creating an acute angle, the two squares meeting at a vertex and making an obtuse angle, and the two squares meeting at a vertex and creating an acute angle. Then within these shapes and categories we quantified the number of vertices and the number and kinds of polygons meeting at each vertex. To aid with this process we used magnetic shapes to discover and look at each shape. Then to get a more in depth look and make sure that each shape in fact fit together smoothly and were polyhedrons we modeled the shapes in GeoGebra which also allowed for color coding and easier quantifying of the vertices.

**Alex Hepburn, SUNY Plattsburgh**

*Bird Migration Modeling*

Abstract: We modeled the path of a bird in both the plane and the sphere. Parameters that were adjustable were both bird and wind speeds. In both situations, a system of differential equations was developed. These were analyzed graphically, numerically, and analytically. This talk will describe our results from these investigations. We'll describe future investigations.

**Elisabeth Howard, Hamilton College**

*Classifying p-adic Fields of Degree $p^2$*

Abstract: For a prime number $p$, the set of all numbers that can be written as the sum of powers of a prime is called the $p$-adic numbers. For example, 15 is a 3-adic number because $15 = 2 \times 31 + 1 \times 32$. This talk will focus on polynomials with $p$-adic coefficients. What makes these polynomials interesting is that for a given degree, there are only finitely many extensions of the $p$-adic field. Specifically, we will discuss the classification of the extension fields of polynomials with degree $p^2$.

**Amy Huddell, Houghton College**

*Exponential Domination in Directed Graphs*

Abstract: An exponential dominating set for a graph is a set of vertices such that every vertex in the graph has a weight of at least 1, where the weight of a vertex is determined by its distance from members of the exponential dominating set. The exponential dominating number of a graph is the size of the smallest exponential dominating set. We extend this definition to directed graphs, where the weight of each vertex is determined by the lengths of the paths from vertices in the dominating set that follow the directions of the edges. In this talk, we give upper and lower bounds for the exponential dominating number of certain types of directed graphs.

**Seongwon Im, St. Lawrence University**

*Are there Racist Soccer Referees?*

Abstract: Soccer is a universal, wide-world sport that anyone can easily participate. Thanks to this, most nations are part of the soccer community and compete against each other. Furthermore, nations hold their own professional leagues where the finest players contest their skills and physical abilities regardless of their nationalities and ethnicities. Unfortunately, while such soccer competitions must retain impartiality and unbiasedness, numerous factors can sabotage soccer matches. One potential factor is a biased decision made by a racist soccer referee. The difficulty of establishing such claim arises as a result of the characteristic of soccer. As soccer is a sport of 22 players with a single ball simultaneously, a referee may miscall a foul purely by a mistake. To determine the probable presence of racist referees, we will explore various statistical approaches categorized by linear, logistic, and Poisson process. Then we fit the data of interactions between soccer players and referees with the best-performing model.

**Heetisha Inderjeet, Ithaca College**

*Even-sided Magic Polygons*

Abstract: The knowledge of magic squares has been around for a very long time; from the legend that the Emperor Yu saw what he called "Lo-shu" on the back of a divine tortoise in the Yellow River of China in about 2200 B.C., to the work of Theon of Smyrna, to Arab astrologers' work on horoscopes in the $9^{th}$ century, to Greek mathematician Moschopoulos' work in 1300 A.D.

Today, it is more likely than not that at one point in school, we were taught about magic squares, which is a way for teachers to present problem-solving exercises and practicing addition. In general Magic squares are grids of a certain size with a special arrangement of the numbers placed in them. These square grids are called magic squares because of the special arrangement of numbers such that every row, every column, and the main diagonals all add up to the same number: the magic sum.

There is a way solve any magic square methodically, but how about for magic polygons in general? My research looks at how to solve magic polygons, such as a magic hexagon. I will describe what a magic polygon is and present methods, strategies, and rules which could eventually lead to a methodical way of solving magic $n-$gons. Solving a magic polygon means finding a special arrangement of numbers such that every side and every diagonal of a particular polygon add up to a magic sum. Only magic polygons with an even number of sides are considered because we proved that it is impossible to have a magic polygon with an odd number of sides.

**Michael Khaimraj, SUNY Fredonia**

*Surface Volumes in* 4 *Dimensions*

Abstract: This talk will derive the 3-dimensional surface "area" element in 4 dimensions, then apply it to various "surfaces" of revolution in 4 dimensions.

**Eric Koessler, SUNY Geneseo**

*Hybridization of Particle Swam Optimization and Pattern Search Algorithms*

Abstract: We test two methods of Hybrid Particle Swarm Optimization (HPSO) algorithms that hybridize Particle Swarm Optimization (PSO) and Pattern Search (PS) to improve the global minima and robustness. Both methods let PSO run first followed by PS. The first method lets PSO use a large number of particles for a limited number of iterations. The second method lets PSO run normally until a tolerance is reached. Numerical results using non-differentiable test functions reveal that both methods improve the global minima and robustness versus PSO. The first method uses fewer function evaluations than the second method.

**George Kuliner, SUNY Geneseo**

*Hybrid Particle Swarm Optimization: Two Approaches using Implicit Filtering*

Abstract: We test two Hybrid Particle Swarm Optimization (HPSO) algorithms that merge Particle Swarm Optimization (PSO) and Implicit Filtering (IF) to increase efficiency. In the first, PSO algorithm is ran with IF finishing the search. In the second IF is ran at every iteration of PSO. We present the types of problems the HPSO algorithms outperform PSO from our results. The Numerical results and the performance for all approaches introduced are dependent on the number of object function evaluations and the minimum function value found.

**Florence R LaPlaca, SUNY Fredonia**

*The Importance of Math in Scientific Research as Seen Through Microplastic Pollution*

Abstract: Microplastic pollution in the Great Lakes region is something open to many different avenues of research and has the potential for many different discoveries. One of particular interest is what exactly are the types of plastics being found in the Lakes and at what percentages. In such a case, the use of statistics is rather fundamental to obtaining results. The focus here is on how the sediment samples compare to the water samples. Particles looked at include foams, lines, fragments, films, and pellets. The analysis used to determine this found that in the Great Lakes, the most commonly found types of plastic in the water column are polystyrene at 19.22% and polypropylene at 31.74%. The most common plastic found that isn't considered to be one of the most commonly used plastics is some terpolymers at 10.45%. For the sediment samples, there is only 1.92% polystyrene and 7.69% polypropylene. The most abundant plastic in the sediment is found to be polyethylene at 43.59% which is only at 5.42% in the water samples. There also appears to be a greater deviation from the plastics deemed to be most commonly used in the sediment samples than the water samples. About a quarter of the sediment samples are "outside the normal" whereas only about a tenth of the water samples are outside this normal. There is still more analysis going on as to why these plastics exist at the levels that they do. It is possible to use a "brute force" method to obtain these statistics, however it is much more efficient to use a program. For this study, the former was used coupled with basic Excel formulas.

**Jason LaRuez, RIT**

*Roles of elasticity and inertia in polymer flows around a sharp bend – A Systematic Mesh Refinement Study*

Abstract: In general, vortex instability in internal flow can occur due to geometrical singularities located at both salient and re-entrant corners of a bend. In the former, viscoelastic stresses are infinitesimal, on the other hand, stresses occurring in the latter region are extremely high under which some viscoelastic fluids exhibit fundamentally different constitutive flow behavior. For low flow rates, polymer flow is steady with a small viscous vortex and no elastic vortex. As the flow rate increases, an elastic vortex can begin to form (independent of the viscous vortex). Recent experiments claimed that shear thinning is necessary for the formation of the lip vortex. In previous work, we have used simulations of various polymeric constitutive models (e.g., Oldroyd-B, FENE-P, Giesekus) in order to predict and determine the roles played by elasticity (namely shear thinning) in the flow around a sharp bend. In the absence of inertia, we showed that shear thinning is not necessary for the formation of the elastic lip vortex. We further showed that it is not a sufficient condition: as the degree of shear thinning increases, the size of the vortex decreases (until disappearing). As an extension of this previous work, we now consider one particular example of the lip vortex and simulated the behavior of the flow as the polymer concentration (inertia) is decreased (increased). Ultimately, we find a transition from the upstream, elastic vortex to a downstream inertial vortex; the latter expected for Newtonian fluids at comparatively high Reynolds numbers. Phase diagrams reveal operating windows within which one can find the elastic, the inertial or no lip vortex. While investigating these inertial and elastic vortices, it was discovered that the shape and size of vortices predicted are very sensitive to the mesh style and size used. Preliminary results show that refining the simulation mesh around the location of vortices elongates the vortex. As a result we are conducting a convergence test by systematically varying the mesh to determine how various characteristics of the mesh impact the flow predictions. The end goal is to optimize a mesh design and establish grid convergence criteria.

**Xizhao Liu, St. Lawrence University**

*Robinson or Doyle? Authorship attribution for 'The Hounds of The Baskervilles"*

Abstract: This presentation is about authorship attribution of "The Hound of the Baskervilles", the third of four novels by Sir Arthur Conan Doyle featuring the detective Sherlock Holmes. After its publication, the novel gained instant success, but controversy came after. There were some claims that Bertram Fletcher Robinson, a very close friend of Conan Doyle, coauthored the book, in some accounts writing the entire first section. We will discuss some stylometric techniques, including cluster analysis, consensus trees, and Burrow's Delta, and then discuss the results from applying these methods to "The Hound of the Baskervilles."

**Nicholas Lynn, St. Lawrence University**

*How to Pick a Winner*

Abstract: In 1951, Kenneth Arrow proved that no voting method can be entirely fair. However, we still need a way to vote. If we have to pick a flawed method of voting, then the following questions are raised: What are the positive and negative aspects of some common voting methods? What voting method is the least unfair? How should we vote and how should we count those votes? Perhaps more importantly, how can we make voters feel that their votes actually matter. We discuss different voting methods, including examples of current use and implications.

**Travis Marnell, St Lawrence University**
*How Math is Solving the Issue of Gerrymandering*

Abstract: Gerrymandering is an issue that arises when states unfairly divide the state into congressional districts. A district must fit within three criteria: equal populations, contiguous, and compact. The compactness of each district is the main complication when it comes to mappings. We will discuss mathematical measures of compactness. In addition, we will discuss how mathematics has been used in recent court cases involving gerrymandering to help solve the issue at hand.

**Molly Marshall, SUNY Geneseo**
*Standing in a Room of Mirrors*

Abstract: Imagine yourself standing in a room full of mirrors, each direction you look there are surrounding copies of you, following each movement. This is what it is like to stand in a platycosm. There exist only ten varieties of this effect, and in this presentation we will discuss what each of them are, how they look, and how they are created. As well as what it would be like to stand in one, like you are standing in a room full of mirrors. Then I will conclude with how we may be living in a universe that looks just like this, possibly, an infinitely large room of mirrors.

**Jonathan McCart, SUNY Geneseo**
*New Criteria for Comparing Global Stochastic Derivative-Free Optimization Algorithms*

Abstract:For many situations, the function that best models a situation or data set can have a derivative that may be difficult or impossible to find. Thus, numerical methods for finding these important values without the direct involvement of the derivative have been developed to find the optimal value of the function. This is our motivation to use Derivative-Free Optimization (DFO) algorithms. In our analysis of these algorithms, we tested three global solvers: Genetic Algorithm (GA), Particle Swarm Optimization (PSO), and Simulating Annealing (SA) on a set of 25 problems of varying types: convex/non-convex, separable/non-separable, differentiable/non-differentiable, and unimodal/multimodal. For each algorithm, we used the built-in code from MATLAB, unedited or revised. For all problems, we varied the number of dimensions, increasing from 2 dimensions to 100 dimensions. We introduce new criteria to compare DFO solver performance using certain generalized characteristics that depend on speed and efficiency. Numerical results proposed for most known standard benchmark problems.

**Bilal Mustafa, Hamilton College**
*A Look At Regularization*

Abstract: I plan to look at papers by Tibshirani, R. and Hastie, T. and comment on their findings. This includes, but is not limited to, a discussion of regularization and how it improves the predictive capabilities of models. I also plan to look at different methods of regularization (Lasso, Ridge, Elastic Net), discuss how they differ in their construction and the effect they have on the limitations of commonly used models.

**Tomoki Noguchi, SUNY Plattsburgh**
*Random Walker Study*

Abstract: In this study, we examined probability distributions of where a single ball is likely to end up using a simple apparatus called the random walker. Two biased situations were analyzed: when the random walker is tilted in one side and when it oscillates. We present experimental data showing how the final distribution of locations changes with this angle of tilt. We derive an analytical model of that final distribution and compare the experimental results to that model. Finally, we present a simulation of how the distribution depends on the oscillation period.

**Eliza Oliver, St. Lawrence University**
*Using the Prisoner's Dilemma to Understand the Spread of Prejudice*

Abstract: While prejudice and hatred continue to permeate the American public through media and prominent public figures, the need for unity has never been greater. Understanding how prejudice travels through crowds is the first step toward finding a solution for this unnecessary conflict. The Prisoner's Dilemma studies strategies for iterative decision making between two parties. It has applications to business and economics, psychology, and international relations. Through the discussion of various strategies players can employ in the Prisoner's Dilemma, we can see how cooperation and defection travel through a crowd. Focusing on the most prominent strategies including, Tit-for-Tat, and changing the conditions of the environment, we will be able to further understand how prejudice travels through a crowd and discuss efforts that can be made to further reduce the spread of prejudice.

**Benjamin Oltsik, Hamilton College**
*Eta-Quotients of Prime or Semiprime Level*

Abstract: Modular forms are types of complex functions critical to understanding number theory. Certain modular forms may be expressed as a product of Dedekind's $\eta$-function. These products are known as $\eta$-quotients. In this talk, we will discuss for what particular levels of modular forms do $\eta$-quotients exist. Specifically, we will focus on prime and semi-prime levels.

**Megan J Ott, SUNY Fredonia**
*An Exploration into the Symmetries of Platonic and Archimedean Solids*

Abstract: We will explore the symmetries of Platonic and Archimedean solids using symmetry type graphs. This work is a report on a paper written by Jurij Kovic. We will make liberal use of manipulatives to demonstrate the ideas.

**Benjamin Parfitt, Hamilton College**
*The Baire facts about the real line and beyond*

Abstract: This talk centers around a famous theorem originally presented by Rene-Louis Baire in his doctoral thesis defense in 1899. The Baire category theorem quantifies the distinction between 'meager' and 'fat' sets, with the real line falling in the latter category on account of the completeness property. Baire's theorem extends beyond the real line to all complete metric spaces (called Banach spaces). We will mention a surprising application to calculus involving the Banach space of all continuous functions on the unit interval.

**Ian Quinn, SUNY Geneseo**
*R-file of Thistle Dispersal Converted into MatLab-file*

Abstract: The Biology department at SUNY Geneseo have used a code in the programming platform R to analyze and record the dispersal patterns of an invasive thistle species. However, this code in R is about 10 years old and it is not as efficient as it could be. The department has expressed concerns that this code is too complicated for many undergraduate students to use or adjust to their needs. I intended on converting this code in R into a MatLab code. Using the notes from the previous two code writers, I recreated the code to be easier to find and change the variables to construct different scenarios.

**Francisco A. Rodriguez-Tineo, St. Lawrence University**
*Prison Gerrymandering*

Abstract: Gerrymandering is the act of politicians manipulating the redrawing of legislative district lines to help their friends and hurt their enemies (Fairvote). As the era of mass incarceration exploded so did prison gerrymandering. Prison gerrymandering has been inescapable because of the Census Bureau's "usual residence rule" (Skocpol, 1483). This study investigates the impacts of prison gerrymandering on county political representations and institutionalized racism by analyzing and synthesizing the theoretical and empirical literature dealing with prison gerrymandering. I hypothesize that prison gerrymandering further continues to support institutionalized racism and skews county political representation.

**Genevieve Rowe, SUNY Geneseo**
*M.C. Escher: Symmetry in Art*

Abstract: Maurits Cornelis Escher ($1898 - 1972$) was a Dutch graphic artist widely recognized for his captivating and mathematically-inspired works of art. However, his comprehensive work in symmetry is perhaps most interesting to the mathematical community. Given his vast knowledge of the 17 canonical wallpaper groups and their defining components, M.C. Escher went on to create a collection of hundreds of drawings, paintings, lithographs, and woodcuts which seamlessly bridge the gap between math and visual art. This talk serves to showcase and dissect the symmetrical theory at play within some of his most famous works.

**Emily Strong, St. John Fisher College**
*Distinguishing Resource Selection from Heavy-Tailed Dispersal in Spatial Epidemic Models*

Abstract: The tail of the dispersal kernel of individuals plays a critical role in the spatial spread of infectious disease, invasive species, and other spreading phenomena. However, most studies where the dispersal kernel has been estimated from observed natural systems have assumed homogeneous dispersal in space, even though non-uniform use of space (i.e., resource selection) has long been recognized as important in many systems. In this study we explore the consequences of ignoring terrain heterogeneity when estimating parameters governing the tail of a dispersal kernel. We show that ignoring resource selection in general leads to estimates of dispersal kernels with heavier tails than the true kernels used for simulation. In addition, this often leads to predictions of the rate of spatial spread of infectious disease that are much faster than the true spread through a population that is moving across patchy terrain.

**Ryan Tamburrino, Hamilton College**
*Eigenvector Centrality in the Context of Board Games*

Abstract: The notion of vertex centrality is key to understanding the structure of a network. Which subway stations are the most important to maintain? Which web pages should a search engine recommend first? The answers to these questions come from a bit of coffee mug wisdom with mathematical ramifications: "it's not about who you are, it's about who you know." Eigenvector centrality is a measure of vertex centrality that formalizes the idea that an important vertex is adjacent to other important vertices. We will explore this powerful tool in the context of the "viral" board game Pandemic.

**Emily Viehl, St. Lawrence University**
*Creating a Content Based Book Recommendation System Using Sentiment Analysis, Stylometry, and Topic Modeling*

Abstract: As the amount of data being collected/made available increases, recommendation systems have become an increasingly popular way to organize information. There are three types of recommender systems: collaborative, content based, and a hybrid method. The collaborative method makes recommendations by collecting information on a specific user, such as their purchase history. In the absence of user data, a content based method can be applied. Content based recommender systems filter information based on characteristics of the content (in this case, content = books). A hybrid method uses both user data and measures of content. The purpose of this project was to create a content based book recommendation for Project Gutenberg (PG) using sentiment analysis, stylometry, topic modeling, and hierarchical clustering. PG is a free online library that contains over $58,000$ books that are available to be downloaded. The books contained in the repository are all works of public domain and range from classic likes Mark Twain's "Adventures of Tom Sawyer" to more obscure books written in Italian. For the purposes of this project only fiction books written in English were included in the recommendation system. PG does not make users create an account to access their site meaning that they do not have data on individual user's behavior. The gutenbergr package allows users to search for and download specific books from PG, therefore a content based approach was used for this project. The "measure" of content that this recommendation system is based on are measures of tone (sentiment), structure (stylometry), and content (topic modeling). Hierarchical clustering was used to group books together based on the metrics listed and the final recommendation system took the form of a Shiny Web Application.

**Gregory Vinal, Jr., SUNY Geneseo**
*Realizing the Symmetries of a Group*

Abstract: In this talk, we will explore the relationship between groups and the symmetries of a Euclidean object. In particular, it is known that the set of automorphisms on a given geometric object or graph form a group. During this talk, we will explore the inverse problem: given an arbitrary group $G$, is it necessarily true that there exists a Euclidean object whose group of symmetries is isomorphic to $G$? We will also ask if there is a systematic way to construct such an object, should one exist. Lastly, we will examine Frucht's Theorem, which answers this question for finite groups, and how his results were expanded upon with respect to infinite groups.

**Gregory Vinal, Jr., SUNY Geneseo**
*Space-Efficient Knot Mosaics of Size* 7

Abstract: In this talk, we will discuss knots, their projections, and representations of those projections. In particular, we will define knot mosaics, a more structured way to represent knots, and look at some rudimentary questions that this representation produces; namely, what is the smallest $n$ such that a given knot can be represented on an $n \times n$ grid, and what is the smallest number of tiles that can be used to represent the knot. Lastly, we will look at my ongoing research into finding knots with mosaic number 7 and their space-efficient representations

**Colin Wilcox, SUNY Geneseo**

*Modeling feral cat population control practices to combat transmission of T. gondii to Hawaiian monk seals*

Abstract: The introduction of feral cats to the Hawaiian islands brought with it Toxoplasma gondii, a destructive protozoan parasite which reproduces solely within the digestive tract of cats. T. gondii readily threatens marine mammals through runoff of oocysts in cat feces into the marine ecosystem. This most notably occurs in the incidental infection of endangered Hawaiian monk seals. We developed a closed system of differential equations to illustrate the spread of T. gondii on and around the island of Oahu in order to test the effects of varying population control methods on feral cats. This model quantifies the resulting populations of mice, cats, and seals over time. Our preliminary results indicate that there would be a single equilibrium value at zero for the feral cat population with the implementation of a complete spay/neuter or euthanasia program. If the parasite T. gondii remains unchecked in this system then the equilibrium value for susceptible monk seals will be at zero because the population will become extinct. These results indicate that a combination of spaying/neutering and euthanasia practices implemented on the cat population will be most effective in reducing this threat toward the endangered monk seal population.

**Jamie Woodworth, Ithaca College**

*Egyptian Expressions: Past and Present*

Abstract: Ancient civilizations developed unique systems of mathematics that laid the foundation for modern math. One of the most overlooked contributions that the ancient Egyptians produced are known as Egyptian expressions. These expressions use unit fractions to represent other fractions, leading to many interesting insights about their properties. Preserved scrolls of papyrus have been found which reveal several applications of the mathematics ancient Egyptians developed. Common uses ranged from settling land disputes to distributing food rations for workers. Despite the math existing for thousands of years, new usages are still being investigated in the modern day. Egyptian expressions are especially interesting in the context of perfect and semiperfect numbers. These numbers have factors that sum exactly to the original number or exceed it respectively. They are described by a specific function indicated by the Greek letter $\phi$. Perfect and semiperfect numbers can be described alternatively by using Egyptian expressions. This provides a fresh perspective on the topic that is worth looking into. Ancient civilizations were much more advanced than we as a modern society give them credit for. Ancient Egyptians laid a substantial mathematical foundation for future generations and bringing awareness to their contributions will help to correct the common misconception that ancient humans were not capable of performing outstanding computational feats.

**Samantha C Woughter, SUNY Fredonia**

*Avocado's Number*

Abstract: Comparing prices of avocados over the past couple of years and determining how many avocados would be needed to give up to afford a down payment on a house.

# Student Poster Session Abstracts

**Eva Balasi, SUNY Brockport**
*Prime numbers between sum of divisors*

Abstract: It has been conjectured that if we look at the sum of the divisors of any number and the number 4 more than it between them there is always a prime number. I am checking if this conjecture is true.

**Xaire Davis, SUNY Brockport**
*Differences of Prime Numbers*

Abstract: Let $p_n$ be the sequence of the prime numbers. So far some of the properties of the differences of consecutive primes have been analyzed. In this project I am looking for patterns in the differences of every other prime, every third prime and every fourth prime.

**Amber Day, SUNY Brockport**
*Comparing differences of consecutive prime numbers*

Abstract: The poster will be on my exploration of consecutive prime numbers to see if there is any sort of relationship between them.

**Courtney Hauf, SUNY Brockport**
*Variations of the Gersgorin Circle Theorem*

Abstract: One of the reasons the Gersgorin Theorem cannot be extended to infinite dimensional Hilbert spaces is the fact that the radii involved may be infinite. We explore ways of replacing the usual radii (which are in $l^1$) with some Euclidean ($l^2$) version.

**Henry Huang, RIT**
*Role of polymer branching on the development of an elastic instability in cross-slot flow*

Abstract: In the last decade, there has been intense experimental investigations into the development of an asymmetric instability in the flow of complex fluids in a cross-slot. To date, numerical investigations into the elastic instability have focused on models for dilute polymer solutions. Near the hyperbolic stagnation point in the cross-slot, the polymer chains orient and stretch resulting in extensional thickening that feeds back on the flow, and may cause an instability whereby the symmetric flow becomes asymmetric. The question we seek to address in this talk is how additional mesoscopic physics, in particular, branching, affect the onset of this instability, and whether we can use such information to control flow behavior.

The focus of this work revolves around numerical simulations of the cross-slot flow of a constitutive model developed to describe entangled, branched polymers, the Pom-Pom model. The model contains material parameters that describe 1) the number of arms, and 2) the ratio of the length of the arms to the length of the main backbone. Varying these parameters controls the shear and extensional rheological behaviors, e.g., shear thinning and extensional thinning/thickening. Using numerical simulations, we show that the model can predict the formation of an asymmetric elastic instability. More importantly, we show how the model parameters, hence the physics, affect the onset of the instability, and, specifically, how the instability can be completely eliminated within certain regimes.

**Michele Iannone, SUNY Brockport**
*Japanese Garden*

Abstract: The Japanese Garden stems off from Geometry. It has seven rocks and from each prescription you can only see six, eye level.

**Trevor Jarvis, SUNY Brockport**
*Isospectral transformations of matrices*

Abstract: I will discuss how the spectrum of a matrix changes through an isospectral transformation and what Greshgorin bounds result in this case. I will show some numerical examples.

**Jennifer Johannes, SUNY Brockport**
*Averaging the prime number distribution*

Abstract: $p_n$ is a sequence of prime numbers, and it is known that $p_n$ is *about* the size of $n\ln(n)$. In this project I will be looking for the best upper bound and the best lower bound for various sequences, including $\frac{(p_1+p_2+...+p_n)}{(1+2+...+n)lnn}$, $\frac{(p_1^2+p_2^2+...+p_n^2)}{(1^2+2^2+...+n^2)ln^2n}$, $\frac{(p_1^3+p_2^3+...+p_n^3)}{(1^3+2^3+...+n^3)ln^3n}$.

**David Knausdorf, SUNY Brockport**
*Estimating the sum of the reciprocal of primes*

Abstract: Let $p_n$ be the sequence of the prime numbers. It is known that the sum of the reciprocal of primes diverges to infinity. In this project I am looking for patterns in estimating the partial sums of this series as functions of logarithms of prime numbers.

**Una M. MacDonald, SUNY Brockport**
*The minimum of some functions of integers*

Abstract: We are looking to find the minimum of $\left|a^3+b^3-c^3\right|$ and $\left|a^4+b^4-c^4\right|$ when $1 \leq a < b < c$.

**Anthony A. Manning, SUNY Brockport**
*Estimating Quotients of Consecutive Primes*

Abstract: With $P_n$ being the sequence of prime numbers, in this project I am looking for estimations about the quotients.

**Brooke Matacale, SUNY Brockport**
*Differences of Roots of Consecutive Prime Numbers*

Abstract: Let $P_n$ be the sequence of the prime numbers. I will be finding the best upper and lower bounds for the given sequences.

**Jared B. McComb, SUNY Brockport**
*Differences of Small Powers of Consecutive Primes*

Abstract: Let $p$ and $q$ be two consecutive prime numbers with $p < q$. It has been conjectured that $q^a - p^a < 11^a - 7^a$ for all values of a between 0 and 1 exclusive. We will look at some example cases to see if the conjecture is true or not.

**Alexa Miles, SUNY Brockport**
*Minimum of Some Differences of Cubes*

Abstract: In this project I am trying to determine numerically the minimum of some functions of integers. Neither the theory from calculus nor the one from operations research apply to this.

**Briana Palmer, SUNY Brockport**
*Quotients related to the prime number distribution*

Abstract: In this project I am looking for the best upper bound and the best lower bound of sequences involving quotients and prime numbers.

**Oana Prajitura, SUNY Brockport**
*Matrices with Oscillating Orbits and Rough Sensitivity to Initial Conditions in a Finite Dimension*

Abstract: When studying matrices and vectors, we can produce various types of orbits that can be characterized in different ways, such as periodicity, boundedness, and spiraling behavior. In particular, matrices are sensitive to initial conditions if they have an unbounded orbit – this type of oscillating behavior is related to Li-Yorke chaos. Using techniques from linear algebra and operator theory, I characterized periodic orbits of matrices, and looked at other types of oscillating orbits.

**Walter Savidis, SUNY Brockport**
*Differences of quotients of consecutive primes*

Abstract: Let $p_n$ be the sequence of the prime numbers. In this project I am looking for the best upper bound and the best lower bound of the sequences.

**Morgan Sherwood, SUNY Brockport**
*Differences of Roots of Products of Consecutive Primes*

Abstract: This project uses a unique computer program to test the sequences for three formulas to find their upper and lower bounds when using the sequence of the 10,000 lowest prime numbers.

**Matthew Too, SUNY Brockport**
*The use of mean value theorem in number theory*

Abstract: In this project we will show how the mean value theorem (an analytic tool) can be used to determine estimations and even exact values for certain discrete functions of prime numbers.

**Elizabeth Waye, SUNY Brockport**
*Completing the Gauss Lucas theorem*

Abstract: The Gauss Lucas theorem says that the zeros of the derivative of a polynomial are in the convex polygon determined by the roots of the polynomial. In this project we will restrict to the case of degree 4 and one root inside the triangle determined by the other 3. This divides the original triangle into 3 smaller triangles. We will analyze what kind of configurations are possible relative to the position of the three roots of the derivative with respect to the 3 triangles.