

THE SEAWAY CURRENT

Newsletter of the Seaway Section of the Mathematical Association of America

SPRING 2018
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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.

Editor

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The College at Brockport will host the Spring 2018 meeting, April 13-14, 2018.

The College at Brockport (SUNY) was founded in 1835 and has an enrollment of approximately 8,000 students. The college mission is to inspire excellence through growth, engagement, and transformation, a mission that is supported by "The Brockport Promise": The College at Brockport promises to engage our students each day in cultivating their capacity for intellectual, physical, and creative accomplishment ([The College at Brockport website](#)).

Thank you, College at Brockport, for hosting our meeting!

SPRING 2018: THE INVITED SPEAKERS



Friday Banquet Speaker:

Eugenia Cheng, School of the Art Institute at Chicago

Title: *How to Bake Pi:*

making abstract mathematics palatable

Abstract: Why does mathematics inspire love in some people and fear in others? Why do some people think mathematics is important for everyone while others think it is a collection of gibberish touching little of the world beyond the brains of some rare geniuses? Why do

some think it is a creative art akin to poetry and music, while others think it is a boring tool for producing answers? In this talk I will present mathematics as a way of thinking, and not just about numbers. I will use a variety of unexpectedly connected examples including music, juggling and baking, as in the title of my recent book. My aim is to show that math can be made fun, intriguing and relevant for people of all ages, by means of hand-on activities, examples that everyone can relate to, and peculiar anecdotes. I will present surprisingly high level mathematics including some advanced abstract algebra usually only seen by maths undergraduates or PhD students, yet show how to make it accessible even to children. There will be a distinct emphasis on edible examples.

Biography:

EUGENIA CHENG is a mathematician and concert pianist. She is Scientist In Residence at the School of the Art Institute of Chicago and won tenure at the University of Sheffield, UK. She has previously taught at the Universities of Cambridge, Chicago and Nice and holds a PhD in pure mathematics from the University of Cambridge. Alongside her research in Category Theory ...

FALL MEETING: October 12 & 13, 2018
at **The University of Toronto - Mississauga**
(Start preparing your trip to Canada!)

... and undergraduate teaching, her aim is to rid the world of “maths phobia.” Eugenia was an early pioneer of maths on YouTube and her videos have been viewed over 10 million times to date. She has also assisted with mathematics in elementary, middle and high schools for 20 years. Her first popular maths book, “How to Bake Pi,” was featured on the Late Show with Stephen Colbert, and “Beyond Infinity” was shortlisted for the Royal Society Science Book Prize 2017. She also writes the *Everyday Math* column for the Wall Street Journal, and recently completed her first mathematical art commission, for Hotel EMC2 in Chicago. She is the founder of the Liederstube, an intimate oasis for art song based in Chicago. Her next book, “Thinking Better: The Art of Logic in an Illogical World” is due out in 2018.

SPRING 2018: SATURDAY INVITED SPEAKERS

The Shape of Associativity

Satyan Devadoss, University of San Diego



Abstract:

Associativity is ubiquitous in mathematics. Unlike commutativity, its more popular cousin, associativity has for the most part taken a backseat in importance. But over the past few decades, this concept has blossomed and matured.

We start with a brief look at how this has transpired, and then explore the visualization of associativity in the forms of polytopes, manifolds, and complexes.

Biography: SATYAN DEVADOSS is the Fletcher Jones Professor of Applied Mathematics and Professor of Computer Science at the University of San Diego. He was a tenured professor at Williams College, and has held visiting positions at Ohio State, UC Berkeley, MSRI, Harvey Mudd, Université Nice, and Stanford. He is an inaugural Fellow of the AMS, and recipient of national teaching awards from the MAA, exploring the intersection of mathematics with origami, painting, architecture, genetics, and design.

Data Analysis in the Mathematics Curriculum

Patti Frazer Lock, St. Lawrence University



Abstract:

Statistics is one of the fastest growing fields nationally and globally. How does this growing interest in statistics and data science fit in with the mathematics curriculum? Should our math majors be exposed to data analysis? If so, what course or courses should they see? What should those courses look like? What recommendations do the national organizations make? And how can we meet those recommendations in a time of limited resources? We will discuss the recommendations, the current status in the field, and ideas for implementing the recommendations.

Biography: PATTI FRAZER LOCK is Cummings Professor of Mathematics in the Department of Mathematics, Computer Science, and Statistics at St. Lawrence University. She is a co-author (with her family) of *Statistics: Unlocking the Power of Data* and she is a co-author (with Deb Hughes-Hallett, et al.) of textbooks on calculus, multivariable calculus, applied calculus, precalculus, and college algebra. She serves on the ASA-MAA Joint Committee on Statistics Education, is a past chair of the SIGMAA on Statistics Education, and is a past member of the MAA's Committee on the Undergraduate Program in Mathematics. She was awarded the 2017 Dex Whittinghill Award for Best Paper in Statistics Education, and she was awarded the 2015-2016 Seaway Section Clarence F. Stephens Distinguished Teaching Award. She is passionate about helping students understand and succeed in mathematics and statistics.

Congratulations to Dr. Carl Lutzer, Clarence Stephens Teaching Award winner!

A faculty member at Rochester Institute of Technology, Dr. Carl Lutzer is well known as a teacher who values active learning, clear thinking, and deep conceptual understanding. In the words of his colleagues: *Carl Lutzer has a reputation among students and faculty at the Rochester Institute of Technology as a teacher of the highest order. He establishes meaningful and respectful relationships with his students, and fosters a remarkable atmosphere of learning and exploration in his classrooms. He is also an outstanding and generous mentor to his junior colleagues, and a leader in the administration of the educational mission of his school, college, and university.* (Cited from award nomination summary.)

Thank you, Dr. Lutzer, for inspiring us to be better teachers!

Does Your Vote Count?

Deanna Haunsperger, MAA President, Carleton College

Abstract:

Are you frustrated that your candidate never wins? Does it seem like your vote doesn't count? Maybe it doesn't. Or at least not as much as the voting method with which you choose to tally the votes. Together we'll take a glimpse into the important, interesting, paradoxical world of the mathematics behind tallying elections.



Biography:

DR. DEANNA HAUNSPERGER is a professor of mathematics at Carleton College in Minnesota. Since her own undergraduate days at a small liberal arts college in Iowa, Deanna has been interested in increasing the number of students who pursue advanced degrees in mathematics. That passion has guided her as a former co-editor for Math Horizons (the Mathematical Association of America's magazine for undergraduates) and as co-founder and co-director of Carleton's Summer Mathematics Program for Women (a successful, intensive four-week summer program to encourage talented undergraduate women to pursue advanced degrees in the mathematical sciences). She has chaired the MAA's Strategic Planning Committee on Students and the Council on Outreach. Deanna is now President of the MAA. Deanna is married to fellow mathematician Steve Kennedy, and together they have two grown children.

SPRING 2018: SPECIAL EVENTS

Seaway NExT Workshop - Engaging Students: Using Clickers in Math Classrooms at all Levels

Hosted by: Patti Frazer Lock (St. Lawrence University)

Friday, April 13, 2:00 - 5:00 Drake Library, 44 Computer Classroom

Description: In this workshop, we will discuss different ways to use clickers in the classroom, the impact on student learning, student reaction to using the clickers, and faculty investment of time. We will illustrate the (fun!) use of the clickers, and will share a wide variety of the types of questions that can be asked across all levels of the undergraduate mathematics and statistics curriculum. If you have ever thought about trying clickers in your classroom, come and join the fun! Please send an email to Nate Reff (nreff@brockport.edu) to confirm attendance.

Math Trivia Contest

Hosted by: Blair Madore (SUNY Potsdam)

Friday night, following the banquet speaker
Cooper Hall, New York Room

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! For information on the contestants from last fall's game show, as well as a sample trivia question, head over to [the Game Show Round-Up!](#)

Workshop on Leadership in the Mathematical Sciences

Topics: How to Assess and Support Student Success

Facilitated by: Mihail Barbosu (RIT)

Saturday, April 14, 1:30 - 2:25

Liberal Arts Building, Room 102

Teachers' Masters Capstone Projects in Secondary and College Mathematics

Session Organizer: Keary Howard (State University of NY at Fredonia) Saturday, April 14, 1:30 - 2:55

Liberal Arts Building, Room 207

Discussing a New Include-Exclusion Principle: Just Include

Facilitated by: Jennifer Biermann, Leah Bridgers (SUNY Oneonta), Deanna Haunsperger (Carleton College), Katelynn Kochalski (SUNY Cortland), & Elizabeth Wilcox (SUNY Oswego)

Saturday, April 14, 1:30 - 2:25

Liberal Arts Building, McCue Auditorium

Description: How can the mathematics community be more inclusive of women and of traditionally under-represented groups? Much progress has been made to include women and traditionally under-represented groups, but the process is not something that can be declared finished – especially because much of that progress hasn't been brought home to the broad collection of individual programs, institutions, and schools but instead has been focused on summer programs or specific mathematics programs. Inclusion continues to be big challenge to members of the math community individually and at a variety of levels – and we all know that when faced with a challenging problem, the hardest part is figuring out how to start addressing the problem ourselves. But we can't afford to be stymied into inaction: too many people already have negative attitudes towards mathematics; let's work on this together! In this session, we will brainstorm ways to open the mathematics community doors even wider. Group discussions will focus on brainstorming steps that departments and our section can take to broaden inclusion.

IBL Special Session: Mathematical Treats for Inquiring Minds

Facilitated by: Jim Matthews (Siena College)

Saturday, April 14, 4:45- 8:00

Liberal Arts Building, Room 107

Description: In this workshop we will share engaging materials that can provide students from kindergarten through calculus with a learning environment based on inquiry. The materials are focused on mathematical problem solving. The problems (fairly) easily lead to students asking their own questions. And they connect to broad mathematical topics including patterns, counting, proportional reasoning, algebraic reasoning, and functional relationships. While we work through workshop materials, we will discuss not only how specific problems can be used but we will also emphasize ways we might encourage pre-service and in-service teachers to incorporate more inquiry based lessons in their teaching. This workshop should be of interest to mathematics teachers of all levels and to college faculty working with pre-service and in-service teachers. Dinner will be provided during the workshop. If you would like to attend, please send an email to Xiao Xiao (xixiao@utica.edu) and indicate if you have any dietary restrictions. This event is organized by Margaret Morrow and Xiao Xiao, and sponsored by **UNYIBL**.

Biography:

JIM MATTHEWS has been a faculty member at Siena College for 35 years. During his tenure at Siena, he has taught mathematics, computer science, and courses for the education department including supervision of student teachers. In recent years he has taught Discrete Mathematics, Analysis of Algorithms, Theory of Computation, and Methods and Materials for Teaching Mathematics.

Prior to joining the faculty at Siena he was a secondary mathematics teacher in Chatham, NY and he has taught mathematics for many years in kindergarten through 6th grade classrooms. He has also worked as a consultant for many school districts and educational associations, the majority of this work for urban and rural schools.

Jim has given hundreds of conference presentations and written articles based on ideas for improving the teaching of mathematics and computer science. He has conducted numerous workshops for mathematics educators, directed and consulted on many grant projects, and helped establish undergraduate and graduate programs for mathematics and science teachers at Rensselaer Polytechnic Institute. Currently, he is the principal investigator for a \$1.2 million NSF grant project to prepare teachers for work in high needs schools.

Jim has served on and chaired committees for the New York State Education Department. He is an active member of the National Council of Teachers of Mathematics, the Association of Mathematics Teachers of New York State (AMTNYS), the National Leadership in Mathematics Education organization (NCSM), the New York State Association of Mathematics Supervisors (NTSAMS), and the Seaway Section of the Mathematical Association of America. He has served on committees and boards for all of these organizations including a term as president of the AMTNYS. Currently, he is president-elect of NYSAMS and on the NCSM board of directors.

Jim has been recognized with a NYNEX award for Excellence in Education, with the Siena College Teaching Award and was an inaugural inductee into the New York State Mathematics Educators Hall of Fame. He was also the back-up keynote speaker for President Obama in 2011.



Congratulations to David Brown!

*Written by Charlie Jacobson,
Chair of the Distinguished Lecturer Committee.*

For the 2018-19 academic year, the Seaway Section takes great pride in naming Dr. David Brown of Ithaca College as our very first Distinguished Lecturer. He has been recognized as an effective and engaging teacher and mentor to his students, earning in 2008 the Henry L. Adler Award for Distinguished Teaching. He is also a part of a five-member faculty team from Ithaca College awarded a grant to support the Robert Noyce Scholarship Program. 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 this new program.

Applying to host a Seaway Distinguished Lecturer:

Apply to host a visit from the 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, 2018**:

1. A brief statement on what the institution would hope to gain from a visit from the Distinguished Lecturer.
2. A list of dates in both terms that the institution would be able to host a visit. The list should be in order of the institution's preference.
3. A list of any amenities that the institution would be able to provide (meals, lodging, etc.). [Note that this does not enter into the decision. We ask for it ahead of time for budgeting purposes only.]
4. Contact information, for communication purposes.

See the [flyer](#) for details!

Seaway Section Announcements:

- After serving as our Section Governor and our Section Representative to the MAA Congress since 2015, James Conklin's term comes to a close on June 30, 2018. Thanks to Jim for serving the section and the members of the section with dedication. **We appreciate all that you have done for us!**
- Starting on July 1, 2018, the new Seaway Section Representative to the MAA Congress is Charles Ragozzine. Ballots for the Seaway Section Representative election were emailed by the MAA to section members in February; the two candidates for the position were Gary Raduns (Roberts Wesleyan College) and Charles Ragozzine (SUNY Oneonta). The election closed on March 13, 2018. *Thanks to both candidates for stepping forward to run for this important position, and congratulations to Charlie for his electoral win!*
- At the upcoming meeting at Brockport, we will vote on the proposed revisions to the section bylaws. The revisions were published in The Seaway Current, volume 40, no. 3. Check out the [section's newsletter website](#) for the full document.
- The membership will also vote on candidates for the positions of Chair-Elect, First Vice Chair / Program Chair, and At-Large Member. For information on the candidates and their biographies, check out [the article on Section Elections](#).

A Message from John Maceli upon receiving the MAA Meritorious Service Award:

I am honored and humbled to receive this award from the MAA. I would like to thank my colleagues in the Seaway Section for their kind and thoughtful words. It is also gratifying to join the list of past winners of this meritorious service award. They, along with others, have been great role models and mentors.

Here is a brief anecdote about my work in the Section. For many years I have volunteered for a local bus service that takes seniors and disabled people to doctor's appointments, etc. I once characterized this work as the "best hours of the week." (family things aside!) In any case, I can say that my 40-plus year relationship with the Section has been some of the best parts of my service to the mathematical and mathematical education communities. As we all know we don't do this kind of service to get awards but it's nice to be recognized by ones peers.



The Seaway Section (as do all sections of the MAA) has many people that work very hard to make things run smoothly. I have been lucky to have had many such colleagues that inspired me. I only hope that I have been able to pass some of this inspiration to others.



Figure 1: Thanks to everyone who played in the Fall 2017 Game Show!

FALL 2017 GAME SHOW ROUND-UP

Last fall, a contingent of students from SUNY Plattsburgh, SUNY Potsdam, and SUNY Fredonia came together to play the Friday evening Trivia/Jeopardy Game Show, hosted by Blair Madore (SUNY Potsdam) and the Student Program Committee. SUNY Fredonia was represented by Megan Ott and the contestants from SUNY Plattsburgh included Riley Bolton, Christopher Camardella, Franquiz Caraballo, Gess Irajii, and Ha Nguyen. The SUNY Potsdam players were Sara Janus, Jasper Toman-Yih, and Toni Wahl.

Everyone who participated had a good time, thanks to the time that Blair Madore invests in preparing for the game show. We're lucky to have a dedicated host like Blair, and the Section is fortunate to have so many students who are interested in having a bit of fun before heading off to bed on the eve of the meeting. Keep bringing on the student and faculty contestants!

To help you get in the mood for the spring game show, ponder this question:

What year saw the death of a great mathematician/scientist and the birth of another?

- (A) 1642 – Galileo and Newton
- (B) 1650 – Descartes and Jacob Bernoulli
- (C) 1716 – Leibniz and Gauss
- (D) 1879 – Riemann and Einstein

Hunt through the Current for Blair's photo and you'll find the answer! (Or, or [take this shortcut](#).)

Update from the Greater Upstate NY IBL Consortium

Written by Ryan Gantner, St. John Fisher College

The Greater Upstate New York Inquiry-Based Learning Consortium is partnering with the [American Institute of Mathematics](#) (AIM) of San Jose, CA, and the Initiative for Mathematics Learning by Inquiry (MLI) of Austin, TX, on an exciting new project on inquiry-based learning in the high school classroom titled "Mentoring in Inquiry Instruction Through Math Teachers' Circles: A Replicable Professional Learning Community Model." Through a generous grant from the [100Kin10 foundation](#), UNY IBL will collaborate with the Math Teacher Circle Network (a subsidiary of AIM) and MLI to develop inquiry oriented course materials for use in high school classrooms and use the Math Teacher Circle model for the dissemination of these materials and for community building. The grant co-PIs are Brianna Donaldson of AIM and Bus Jacob of MLI. Ryan Gantner of St. John Fisher College will direct the efforts in New York, which include faculty leaders Jane Cushman of Buffalo State College, Keiko Dow of D'Youville College, and Yousuf George of Nazareth College, as well as many yet-to-be-determined teacher leaders from high schools in Rochester and Buffalo.

This project combines the best practices of two proven, complementary models to empower in-service and pre-service teachers to actively engage their students as creative thinkers and problem solvers. Through participating in collaborative Math Teachers' Circle (MTC) and Inquiry-Based Learning (IBL) sessions, teachers will develop the confidence, persistence, and motivation to engage their students in active mathematics learning. Classroom-ready resources created by their peers will empower teachers to experiment with incorporating inquiry-oriented instructional strategies into their own classrooms. Ongoing MTC/IBL meetings will mentor teachers toward progressively implementing more active learning experiences over time, and will help develop a supportive secondary/post-secondary community of like-minded mathematical thinkers that will encourage retention in the teaching profession and in the Buffalo and Rochester areas.

The project will launch in summer 2018 with workshops designed to build inquiry, problem-based materials for various topics in the high school curriculum. It will continue throughout the 2018 - 2019 academic year with testing of materials, mentoring and observation, and dissemination of ideas via MTC events in Buffalo and Rochester. The process repeats itself and ramps up participation in 2019 - 2020. If you know high school teachers who might be interested in such a project, please contact one of the faculty team members: [Jane Cushman](#), [Keiko Dow](#), [Ryan Gantner](#), or [Yousuf George](#).

Hi, there, Canada: The Seaway Section is coming back!

For the first time since 2005, the Seaway Section meeting is coming back to Canada! For some folks in the Seaway Section, this will be their first time traveling internationally or the first time taking students on an international trip. Our members living in Canada are probably old pros at the process by now, for the newbies among us, here are a few tips to think about as you plan.



- **Start early!**
- **Read up** on visiting Canada: [Canada's Border Services Agency website](#) is a good place to start.
- **Proper Identification:** Working with your students to get passports, birth certificates, permanent resident cards, or enhanced driver's licenses. Check out the [U.S. State Department's website](#) with info on applying for a passport. The paperwork takes time and costs money; start early. International students may require visas to travel to Canada and definitely need their residency paperwork to get back into the U.S. Be sensitive, too – some of your students may not be comfortable disclosing their citizenship status with you, so don't ask. Just provide options.
- **Consult with your Study Abroad or International Office:** All departments that anticipate sending students to the meeting are advised to consult with their study abroad or international office to learn about the school's procedures and regulations. Every school has different policies and it's important to know what's expected of students and faculty travelling abroad.
- **SUNY has a new international travel with students policy!** Check it out at the website [here](#). In particular, all international travel involving SUNY faculty members and students requires that students have international insurance (\$29 per student), faculty leaders complete training, and everyone fill out extensive paperwork. Be proactive and get this sorted early!
- **Reimbursement Paperwork:** Are there any additional procedures or requirements to be reimbursed for international travel expenses? Will university-owned credit cards be used for the expenses? Will your university reimburse you for the fee that your credit card company charges for non-USD charges? How about the fee for converting U.S. dollars into Canadian dollars?
- **Currency Conversion Rates:** If you plan to convert some of your money into Canadian money, shop around to see who can offer you the best rates. Try your bank, or [AAA](#). It probably would be a good idea to have some cash on hand, just in case.
- **Cell Coverage:** OMG! Will your cell phone work? What will the rates be? How will you post all of your selfies from Canada to Facebook? Or, how might you call your kids to say good-night? Contact your provider and get the details for your phone and plan.

With some careful planning, you'll have an awesome trip . . . and your students will, too!

A LEGACY OF LEADERSHIP

A Note from the Section Chair



As a relative newcomer to the Seaway Section, I don't know as much about Clarence Stephens as many others do. But what I have managed to learn has left a deep impression. A longtime member who interacted with Stephens at section meetings wrote, "One adjective I'd use to describe him: 'revered.'" As for his students, they were more concerned that they would disappoint him than they were about getting bad grades. I once got the following message in a fortune cookie: "A leader is someone you will follow to a place you wouldn't go on your own." This saying alludes to a key truth about effective leadership: It consists not in making people do what you want, but in arousing in them an eager desire of their own to do what is best, even when it is a daunting challenge. Stephens accomplished this to an astounding level, not just with his own students, but with the entire departments (teams!) that he chaired, especially at SUNY Potsdam.

I am left wondering how I can achieve a similar effect with my students, in my department, with my own kids at home, and in other areas. And how can you achieve it? There will only ever be one Clarence Stephens. We could spend our whole lives chasing his vision and never fully realize it. As for me, I am compelled to chase it anyway, because even through the expanses of time, space, and second-hand accounts that separate us, his leadership is affecting me.

In his 1987 *American Mathematical Monthly* article, "A Modern Fairy Tale?", John Poland attributed the success of the Potsdam Model to "simply the transforming power of love, love through encouragement, caring and the fostering of a supportive environment." While this is a key insight, more details are needed in order to really understand the approach. I encourage you to learn all you can about Clarence Stephens and the type of learning environment he created. An article in the February 2010 edition of *Math Horizons* is one good starting place. Furthermore, we have a number of people in our section who remember Clarence and worked with him. We could find out a lot by talking with them about what they remember. I'll even suggest that their memories might be recorded, in sound or in writing, so that future generations may also benefit from these perspectives.

The Seaway Section will continue to carry on Stephens' legacy of impactful teaching and leadership. We do this by recognizing extraordinarily successful teaching via the Clarence F. Stephens Distinguished Teaching Award, by promoting inspiring exposition through the new Seaway Distinguished Lecturer program, by enhancing professional development via Seaway NExT, in our discussions on effective teaching at meetings and via email, and in our workshops on leadership in the mathematical sciences, among other ways. And, like Stephens, who chaired the section in 1971-1972, we do it by stepping up and taking on leadership roles.

To serve as a catalyst like this, the section needs both effective structure and a boatload of volunteers willing to devote their time to making the section work. The foundation of the section's structure is its bylaws. I'm heartily grateful to the Extended Executive Committee members who have worked hard over the past year to revise our bylaws into a much clearer, sleeker guiding document for our operations. And, just as many offered comments on the bylaws proposal draft at the Fall 2017 meeting, I encourage all members to participate in this process by voting on the final proposal at the upcoming business meeting in Brockport. To those who served 2016-2018 terms on our committees, I thank you for your work, which has enabled the section to accomplish so much. I also appreciate immensely, as we all should, those who have answered or will answer the call to serve for the next two years, as I work to finalize the 2018-2020 committees over the next couple weeks. The tasks may at times be tedious and frustrating. Believe me, after a year of dealing with bylaws revision, I can relate! But, whether by serving on a committee, attending a meeting, giving a talk, contributing to a discussion, or simply sending news items to the Current, remember the big picture—the legacy of mathematics, teaching, and leadership that you are preserving and expanding to new heights.

Jonathan Cox (State University of New York at Fredonia)

Seaway Section Chair

SECTION ELECTIONS - SPRING 2018

During the Business Meeting on Saturday, April 14, elections for the officers of Chair-Elect, Program Chair (perhaps formerly “First Vice-Chair / Program Chair”), and At-Large Member will take place. The nominations brought forth by the Nominations Committee, appointed by the Section Chair and consisting of Margaret Morrow (chair), Joe Straight, and Joe Petrillo, are as follows:

- Chair-Elect (1-year term): Cheryl Chute Miller, SUNY Potsdam
- Program Chair (2-year term): Elizabeth Wilcox, SUNY Oswego
- At-Large Member (2-year term): Jeff Johannes, SUNY Geneseo

Additionally, the membership will vote on whether or not to approve revisions to the section by-laws (detailed in the Winter Edition of this newsletter). Please read the by-law revisions before the Business Meeting.

Nominee Biographies:

DR. CHERYL CHUTE MILLER received her PhD at Wesleyan University in 1989, in Logic, and immediately began her teaching career at SUNY Potsdam. She is currently Professor of Mathematics and was director of the Learning and Teaching Excellence Center (now the Center for Creative Instruction) for 9 years. Her textbook *Essentials of Modern Algebra* is currently being revised for a second edition, and for the last 5 years she has been co-teaching a travel course to Mexico, related to the origins of mathematics, with her colleague Dr. Blair Madore. Cheryl lives in Potsdam with her husband Jeff, and yellow lab Willow, while her daughter is finishing her second year at Smith College in Northampton, MA.

JEFF JOHANNES: I have been in the Seaway section since Fall 2001. Since then, I have missed one Seaway meeting (and I hope to get another chance to make it to Elmira someday). Both the MAA and the Seaway section are a safe home for me, and I always hope to contribute what I can to make them the same for others. I have enjoyed serving the section in several roles (student program, Project NExT, liaison coordinator, program committee, and member at-large). I am grateful for opportunities to serve and work with my friends in the Seaway section, and will continue to always appreciate.

ELIZABETH WILCOX began attending Seaway Section meetings while a graduate student at Binghamton University. Now an assistant professor at the State University of New York at Oswego, Elizabeth’s involvement with the Seaway Section has grown alongside her career: becoming a member of the Student Program Committee, then becoming editor of the Seaway Current, and now nominated for Program Chair. All along, Elizabeth’s love of teaching mathematics and working with students, as well as writing about mathematics, has continued to be a driving force behind her work. For relaxation and leisure, Elizabeth enjoys knitting, cooking, walking, and tending to a menagerie of furry and feathered friends, among many and varied hobbies.

SECTION NOTES - SPRING 2018

This edition’s Section Notes come to us from:

- Greater Upstate NY IBL Consortium
- St. John Fisher College
- State University of New York at Fredonia
- State University of New York at Oswego

Greater Upstate NY IBL Consortium:

The Greater Upstate New York Inquiry-Based Learning Consortium is enjoying another year of activities. While our initial funding from the Educational Advancement Foundation ran out in the summer of 2017, in October we were able to secure a small grant from the Initiative for Mathematics Learning by Inquiry to continue our (revised) mission of maintaining and sustaining a network of IBL practitioners in the Upstate New York area and beyond. With this, we have been able to continue some of the programs that we have run in the past as well as develop a new component.

We are continuing to host informal dinner meetings to discuss inquiry-based learning with those interested in talking about it in an informal setting. As of this writing, meetings have been held in Victor (Rochester area), Niagara Falls, Buffalo, and Syracuse. We are also continuing our mentoring program, whereby instructors can request an IBL mentor to talk to as they teach using IBL methods. We are able to match people up with others in the region so that there is always someone to turn to for conversation, advice, and wisdom as one embarks through an inquiry class experience. Finally, we are hosting an IBL workshop at the Seaway spring meeting. I bet the food there will be awesome! You should definitely come.

We've also started a new facet to our existence, which is an outreach program to the K-12 community. With some funding, we began (or rather, resurrected) the Rochester Math Teachers' Circle, a community of middle- and high-school teachers which meets monthly throughout the spring semester in 2018. We explore topics which are mathematically interesting, lend themselves to student inquiry, touch on the common core practice standards, and could extend themselves to classroom use. Matt Thomas of Ithaca College, Ryan Gantner of St. John Fisher College, and Nicole Jursivich of Nazareth College are leading this initiative. The meetings themselves are at St. John Fisher College.

Beginning in the summer of 2018, we'll expand our Math Teachers' Circle presence with another, more ambitious project. The two year endeavor, titled "Mentoring in Inquiry Instruction Through Math Teachers' Circles: A Replicable Professional Learning Community Model" is detailed in [a separate article](#) in this issue of the Current. *(Submitted by Ryan Gantner)*

St. John Fisher College:

Dr. Daniel Cass of the Math Department at St. John Fisher College has retired after 32 years. He earned his PhD at SUNY Stony Brook on "Recurrent Leaves in Foliations." Among his many publications, two stand out in popularity and accessibility, co-authored with colleague Gerald Wildenberg: "[Relations Between Surface Area and Volume in Lakes](#)," *College Math Journal* 21(5): (1990), and "[A Novel Proof of the Infinitude of Primes, revisited](#)," *Mathematics Magazine*, 76: (2003). Dan also helped to coach the department's Putnam Exam participants. *(Submitted by Don Muench)*



State University of New York at Fredonia:



- Nancy Boynton is retiring at the end of this academic year after 35 years at Fredonia.
- Keary Howard was honored with a Distinguished Service Award from [The Association of Mathematics Teachers of New York State](#) (AMTNYS).
- Senior Lecturer Kim Conti earned the 2018 Fredonia President's Award for Excellence in Teaching and Learning.
- Tedi Cox has taken over editorship of the [New York State Mathematics Teachers' Journal](#) from Bob Rogers.

(Submitted by Jonathan Cox)

Trivia Question Solution

The answer is (A). Note that 1643 is usually reported for Newton's birth due to the shift in the Gregorian calendar long after his birth, so 1642 is still good! The lifespan of the mathematician/scientists are as follows:

Galileo (1564 - 1642)	Newton (1642 - 1727)
Descartes (1596 - 1650)	Jacob Bernoulli (1655 - 1705)
Leibniz (1646 - 1716)	Gauss (1777 - 1855)
Riemann (1826 - 1866)	Einstein (1879 - 1955)



State University of New York at Oswego:



The Mathematics Department at SUNY Oswego is sad to announce the retirements of professors Mark Elmer, Zohra Manseur, and Terry Tiballi at the end of the 2018-2019 academic year, representing a loss of over 70 combined years of service. It's hard to imagine our department without Drs. Elmer, Manseur, and Tiballi as each one has contributed in individual ways to the community and offerings of the Mathematics Department. We thank them for their hard work and dedication, and wish them the very best for their new adventures in retirement.

In anticipation of the faculty turnover at the end of the academic year, we are pleased to announced the successful hiring of Drs. Dan Kraus, Hao Zheng, and Jessalyn Bolkema. These individuals are joining both the Math Department and the Seaway Section, and we look forward to many years of growth for our new faculty members, our students, and our program. *(Submitted by the PR Committee in the Mathematics Department at SUNY Oswego)*

REPORTS & MINUTES SINCE FALL 2017

1. SEAWAY SECTION REPRESENTATIVE'S REPORT – SPRING 2018

James Conklin, Seaway Section Representative to the MAA Congress

The newly constituted Congress of the MAA had its second meeting at the JMM meeting in San Diego in January. There were several important announcements that the Board of Directors had that they would like the members of the Congress to pass on to the sections:

- After years of work and negotiations the MAA has finalized partnerships for publications. The MAA Journals and Magazines are now published in a partnership with the Taylor & Francis Group and the books from the MAA press will now be published as in imprint of the AMS Book Program. It is anticipated that these partnerships will bring financial benefits to the publishing side of MAA and open new markets and venues (especially internationally) for all of its high quality offerings. In both partnerships MAA maintained complete editorial control over its publications.
- The MAA has launched its [MAA Career Resource center](#) that in addition to job postings and alerts will have articles about career advice for students and profiles of featured employers.
- Announced new officers to the Board of Directors, including President-Elect Michael Dorff from Brigham Young University and Vice President Carol Schumacher from Kenyon College. (Carol was one of our speakers at a recent Seaway meeting.)
- Announced that over 300,000 students participated in this year's [MAA American Mathematics Competitions](#) this year.
- Announced adoption of the mission statement of the MAA: The mission of the Mathematical Association of America is to advance the understanding of mathematics and its impact on our world.
- Urged consideration for all our departments of MAA Departmental Memberships. Benefits include memberships for all nominated students, discounts on hosted WeBWork courses, discounts on Maplesoft-MAA Placements Tests and discounts on departmental job postings. More information can be found at [the Membership portal](#).
- Urged members to consider becoming involved on national committees. If any of you would like to become more involved at the national level (or know of a colleague who would), please let me know (conklin@ithaca.edu) and I can put names forward.

This is still a transition period as the new Congress finds and defines its role in the new MAA governing structure and the nature of that role was a topic of discussion at the meeting in San Diego. The meeting included discussion and approval of updates to the bylaws of the Congress as well as exchanges of ideas of the most effective structure and content of future meetings. Largely as a cost saving effort, it has been decided to just have one formal annual meeting of the Congress (at MathFest meetings), probably arranging some kind of “e-meeting” opportunity during the JMM times.

It has been my extreme honor and privilege to be able to serve as the representative from Seaway to the MAA Board of Governors/Congress over the last couple of years. Getting to see things from a national perspective has repeatedly made me proud of the excellence of the people and accomplishments of our Section. I would like to give a heartfelt thanks to all of you who work so hard to make the Seaway Section great and wish all the best to Charles Ragozzine as he begins his term in the MAA Congress this summer.

Respectfully submitted by Jim Conklin (Ithaca College), Seaway Section Representative to the MAA Congress

2. TREASURER'S REPORT – SPRING 2018

Gary Towsley, Seaway Section Treasurer

Balance as of 9/1/2017		\$15,869.64
Fall Meeting at SUNY Broome		
Meeting Receipts	\$6,020.74	
Meeting Expenses	\$5,131.54	
Speaker Expenses	\$543.29	
Net		\$345.91
MAA Subvention		\$1161
Travel Support for Representative		\$500
Balance as of 3/15/2017		\$16,877.15

3. THE EXECUTIVE COMMITTEE MEETING – October 20, 2017

Present: Jonathan Cox, Cheryl Miller, Steve Kilner, Jim Conklin, Ryan Gantner. Gary Towsley and Gary Raduns joined late. Luis Moreno, local host of the conference, joined for a portion of the meeting.

The meeting was called to order at 3:10 pm.

Approval of minutes: There is a discrepancy between the minutes posted in the Current and the ones circulated from the meeting. The ones in the Current have some errors corrected, so the discrepancies are taken as proposed changes. Other minor changes brought forth by Gantner. Minutes approved as amended.

Section Representative Jim Conklin provided a written report. He highlighted:

- Agreement with AMS for publishing. Could save/make MAA a lot of money. Publishing generates a large amount of revenue, though not as much as historically.
- The meeting at MathFest involved finding the role of new representative structure. Idea is that the new congress can now focus on being representatives of sections rather than just stamping business of MAA, but this last meeting was more about figure out what its role is. This one was billed as an “orientation” meeting, as if everyone was “new” to the process (even though some have been in the Governor’s position for a while). The vision for the populace was not 100% unified.

Program Chair Cheryl Miller gave a report which included the following:

- We will strive to have a micro-course at each fall meeting
- At this meeting there are 10 contributed talks + 7 talks in a special IBL session + leadership workshop + 14 student talks (approx)
- Approx. 144 people registered, plus 15 NYSMATYC as of last count
- At the upcoming Brockport meeting next spring, the presenters will be MAA President Deanna Haunsperger, Satyan Devadoss (Gehman), Patti Frazer Lock

Chair Jonathan Cox mentioned that we are no longer pursuing a joint meeting with HRUMC. We are currently seeking venues for Spring 2019 and beyond. He brought to the group’s attention that there were some difficulties in the credit card payment system for this meeting. Gary Towsley confirmed that PayPal was acting unexpectedly and that steps would be taken to prevent these issues from happening at subsequent meetings. Jon informed the group of the MAA’s e-mail non-engagement list. The board found this troubling and after some discussion decided that making the presence of this list widely known may be counterproductive, causing people to withdraw from MAA communications completely rather than opt-in. Jon and Jim Conklin will try to convince the MAA that this communication strategy is unacceptable. Finally, Jon presented plans for an attendance incentive prize to be awarded at this meeting and the logistics for administering this were discussed.

The treasurer, Gary Towsley, submitted a report. Over the past six months, the section netted a gain of \$40.

There was no report from Past Chair Ryan Gantner.

Old Business

- The Executive Committee gave some guidance to the Seaway Distinguished Lecturer Committee on a number of matters regarding their charge. They will aim to solicit nominations soon so that the first one can begin this spring.
- Substantial time was spent addressing revision of the bylaws. We walked through the big items and asked which ones demanded discussion. Among the items which generated the most discussion were
 - Term limit on treasurer
 - Discussion of delegation authority
 - Discussion of who can vote for bylaws
 - Why is the Section Representative on Educational Policy committee?

Executive committee adjourned at 5:30 pm.

*Respectfully submitted, with thanks to Ryan Gantner for notes on the Executive Committee meeting,
by Gary L. Raduns, Jr. (Roberts Wesleyan College), Seaway Section Secretary*

4. THE EXTENDED EXECUTIVE COMMITTEE MEETING – October 20, 2017

The participants were joined by Blair Madore and by Erin Newston, NYSMATYC Representative.

The Extended Executive Committee briefly reviewed items from the Executive Committee meeting:

- Need earlier start and notification of meetings
- MAA's e-mail blacklist
- Will give away five certificates entitling recipient to free registration for an upcoming meeting if they bring someone who hasn't attended in the last five years.
- Progress on the Seaway Distinguished Lecturer Program.

The Program Committee, Cheryl Miller, provided a written report. Registration totals about 144 with 15 NYSMATYC members were registered. The next meeting will be at The College at Brockport, April 13-14, 2018.

The Student Program Committee presented a written report and highlights 14 student presentations at this meeting and a game show Friday evening to be hosted by Blair Madore.

The Randolph Lecture Committee (Blair Madore, chair) reports a late change in the speaker line-up. Yousuf George will speak Fall 2018.

The Gehman Lecture Committee reports it has arranged for Satyan Devadoss to speak at the Spring 2018 meeting.

Educational Policies Committee has no report.

Distinguished Teaching Award Committee (Chris Leary, chair) has no report.

The Nominations Committee reports the nomination of John Maceli for the Meritorious Service award. The committee is working on nominations for Section Representative.

There is no report from the Liaisons Coordinator.

The Ext. Exec. Comm. extends its thanks to the Seaway Current Editor, Elizabeth Wilcox, for a nice job.

The Seaway NEXt Advisory Committee had no report.

The Webmaster was not present and did not provide a report. The Ext. Exec. Comm. discussed the need to update the webpage for content and current browsing habits (in particular mobile devices) and noted delay in linking to the meeting site – an issue that hasn't usually occurred.

In related open discussion, the Ext. Exec. Comm. considered whether to bring registration processes and meeting site hosting to the charge of the Section rather than local organizers. There was also discussion of the use and value of the section's website as a historical archive. An *ad hoc* committee will be established to consider these topics.

Old Business

- Update on the progress on Seaway Distinguished Lecture program was handled earlier in the meeting.
- The Ext. Exec. Comm. discussed progress on by-laws and the amendment process.

The Extended Executive Committee adjourned at 5:59 pm.

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

5. THE BUSINESS MEETING – October 21, 2017

The meeting was called to order at 9:50 am.

Minutes of the previous meeting were approved with corrections to spelling and clarification of a line that appears to have been omitted.

The Chair reported:

- Attendance incentive: Five certificates will be awarded by lottery entitling the recipient to free attendance at a future meeting provided they bring a newcomer (some who has not attended in the past five years).
- Our experience with online registration and payment was a “learning experience” using PayPal.
- An implementation committee consisting of five (Elizabeth Wilcox, Olympia Nicodemi, Gary Towsley, Jeff Johannes, and Charles Jacobson) is working to recruit/nominate the first Seaway Distinguished Lecturer. The lecturer will give about three talks a semester with travel support from the Section. The inaugural year is expected to be 2018-19.

The Section Representative provided a report in the Seaway Current but highlighted five points:

- The primary role of the Section Representative is to represent the Section and its constituency to the Association.
- The American Mathematical Society has acquired the MAA Books Program. The MAA will maintain editorial control.
- The MAA is entering into an agreement with Taylor and Francis for journal publication.
- The MAA adopted a new mission statement: “The mission of the MAA is to advance the understanding of mathematics and its impact on our world.”
- MAA Next currently has 90 new fellows. The goal is to increase to approximately 130 fellows over the next few years.

The Treasurer provided a report in the Seaway Current and highlights that the balance is healthy and is up \$40 since the last meeting.

The First Vice-Chair reminds all that the next meeting will be at The College at Brockport and will feature Deanna Haunsperger, president of the MAA.

Student Program Committee expressed its thanks to Blair Madore for hosting the math game show Friday evening and highlighted the student talks to be given this afternoon.

The Randolph Lecture Committee indicated that the Randolph Lecture would be given this morning by Yousuf George and they have a commitment for the Fall 2018 meeting.

The Gehman Lecture Committee reports that Satyan Devadoss will deliver the Gehman Lecture at the spring meeting. The committee is looking for suggestions for the Spring 2019 meeting.

The Seaway Current editor encourages contributions for future editions.

The Chair reviewed proposed by-laws revisions in process at the time. There was discussion of these revisions, principally regarding term limits for the treasurer. Gary Towsley commented in reply and supportive of the term limits.

The meeting adjourned at 10:25 am.

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

Contributed Talk Schedule

Liberal Arts Building, McCue Auditorium

- 1:30-2:25 **Jennifer Biermann, Leah Bridgers**, SUNY Oneonta, **Deanna Haunsperger**, Carleton College, **Katelynn Kochalski**, SUNY Cortland, **Elizabeth Wilcox**, SUNY Oswego, *Discussing A New Inclusion-Exclusion Principle: Just Include.*
2:30-2:55 Discussion
3:00-3:25 **Jonathan Brown and Leah Bridgers**, SUNY Oneonta, *Starting a Small Town Elementary School Math Circle*

Liberal Arts Building, 107

- 1:30-1:55 **John Myers**, SUNY Oswego, *Secrets of Curve Singularities*
2:00-2:25 **Bonnie Jacobs**, RIT, *Distance Swap Graph.*
2:30-2:55 **Gregory Quenell**, Plattsburgh State University, *RSA Cryptography in the Textbook and in the Field*
3:00-3:25 **Jobby Jacobs**, RIT, *Graph Labeling Based on Distance One and Two*

Liberal Arts Building, 106A

- 1:30-1:55 **Marvin Gruber**, RIT, *Using the Cauchy-Schwarz Inequality to Compare the Efficiency of Regression Estimators*
2:00-2:25 **Ahmad Almomani**, SUNY Geneseo, *Unsupervised Particle Swarm Optimization*
2:30-2:55 **Jonathan Lopez**, Canisius College, *Graph Coverings and the ABCDEFG Classification*
3:00-3:25 **Sam Northshield**, SUNY Plattsburg, *Conway Topographs: from Fermat's two-square theorem to graph periodicity to the rascal triangle.*

Liberal Arts Building, 106B

- 1:30-1:55 **Yozo Mikata**, Bechtel, *Graphene Self-Folding Problems*
2:00-2:25 **Scott Greenhalgh, Rebecca Schmidt, Troy Day**, Queen's University, *Fighting the Public Health Burden of AIDS with the Human Pegivirus*
2:30-2:55 **Jason R. Morris**, SUNY Brockport, *Familiar (and less familiar) Function and Sequence Spaces*
3:00-3:25 **Jingxian Hu**, Hamilton College, *The Effect of Demographic Factors on Hourly Wages*

Liberal Arts Building, 102

- 1:30-2:25 **Mihail Barbosu**, RIT, *Leadership in the Mathematical Sciences: How to Assess and Support Student Success*
2:30-2:55 Discussion
3:00-3:25 **Robert Rogers**, SUNY Fredonia, *Riemann Sums Should be Taught at the End of Integral Calculus, Not in the Beginning.*

Liberal Arts Building, 207

Teachers' Masters Capstone Projects in Secondary and College Mathematics Session Organizer, Keary Howard, SUNY Fredonia

- 1:30-1:42 **Sarah Mannion**, Northern Chautauqua Catholic School: *A Study of Eighth Grade and Pre-Calculus Students and Their Misconceptions of Exponents and the Order of Operations*
- 1:43-1:55 **Samantha Nickerson**, SUNY Fredonia: *The Effects of Mathematical Vocabulary and Notation on Student Learning.*
- 2:00-2:12 **Dakota Morano**, SUNY Fredonia: *An Exploration of Situated Cognition and Physical Context within the Statistics Classroom.*
- 2:13-2:25 **Michelle E. Persaud**, SUNY Fredonia: *An Analysis of Student Conceptual Understanding of Unit Circle and Right Triangle Trigonometry.*
- 2:30-2:55 **Emily Fay**, SUNY Fredonia: *Derivatives Deficiencies: An Analysis of College Students' Misconceptions Regarding Derivatives and their Applications*

Student Talk Schedule

Liberal Arts Building, Room 208

1:30-1:55 **Abraham Glasser and Emily Lederman**, Rochester Institute of Technology, *Failed Power Domination: Computational Results, Extreme Values, and Complexity*

2:00-2:25 **Haoxiang Yang**, Hamilton College, *Locally Recoverable Codes: A Technique for Creating Multiple Recovery Sets*

2:30-2:55 **Kellie Halladay**, SUNY Fredonia, *A New Approach to Optimal Solution of Rubik's Cubes with Half Turns*

Liberal Arts Building, Room 206A

1:30-1:42 **Molly Noel and Noelle Sullivan**, Ithaca College, *Extension of Kaprekar's Algorithm to Arbitrary Bases*

1:45-1:57 **Elise LePage**, Hamilton College, *Calculating Clebsch-Gordan Coefficients Using Young Tableaux*

2:00-2:12 **Daniel Akimchuk**, Ithaca College, *The Behavior of Rational Squares*

2:15-2:27 **Narges Iraj**, SUNY Plattsburgh, *Modeling Cadmium Concentration in Human Body*

2:30-2:42 **Gabriella Pesce and Samantha Todres**, Ithaca College, *A Two-Piece Puzzle...How Hard Could It Be?*

2:45-2:57 **Peter DeWeirdt**, Hamilton College, *Nothing but Elastic-net: NCAA Tournament Prediction Using Penalized Regression*

3:00-3:12 **Jichen Huang**, Hamilton College, *Non-isomorphic Spanning Trees of Graphs*

Liberal Arts Building, Room 206B

1:30-1:42 **Alexander Dennis**, Hamilton College, *Guardians of the Gallery*

1:45-1:57 **Jonathan Backus**, SUNY Oswego, *Applying Board Tilings to Solve Counting Problems*

2:00-2:12 **Virtee Parekh**, Rochester Institute of Technology, *Artificial Intelligence for Machine Health Prediction*

2:15-2:27 **Brielle Kwarta and Ben Reber**, Houghton College, *Optimal Growth Allocation in *Sarracenia purpurea* in Varying Environments*

2:30-2:42 **Sarah Hoover**, Hamilton College, *Measuring Fairness: The Mathematics of Gerrymandering*

2:45-2:57 **Wenshi Wang**, Hobart and William Smith Colleges, *Reducing the Dimension of Tree Space*

3:00-3:12 **Jingxian Hu**, Hamilton College, *The Effect of Demographic Factors on Hourly Wages*

3:15-3:27 **Abbas Rehmani**, Rochester Institute of Technology, ???????????

Liberal Arts Building, Room 108

Poster Session 1:30 – 3:00

Michelle Ade-Browne, The College at Brockport, *Averaging Approximations of Integrals*

Amanda Bartolotta, The College at Brockport, *Comparing Areas Inside a Circle*

Michael Berezny, Victor Braescu, Andrew Lewis, Eric Pareis, Art North, Rochester Institute of Technology, *Small Spacecraft Solar Propulsion*

Ashley Case, The College at Brockport, *Multivariable Inequalities using Lagrange Multipliers*

Michael Champlin, The College at Brockport, *Variations of Simpson's Method*

Luke Duttweiler, The College at Brockport, *The Maximum is not a Kernel Function*

Shoshanna Longo, Rochester Institute of Technology, *Approximate Solutions to Lane-Emden Equation for Stellar Configuration*

Shane Merritt, The College at Brockport, *An Integral Limit*

Chelsea Soprano, The College at Brockport, *Comparing Areas Inside a Circle*

Kelly Waters, The College at Brockport, *Boole Method for Numerical Integration*

Contributed Talks

Abstracts

1. **Ahmad Almomani**, SUNY Geneseo

Unsupervised Particle Swarm Optimization

Swarm Optimization (PSO) has shown to be efficient, simple, and flexible optimization algorithm. But it suffers from a major drawback that it is possible to converge to a local optimum and not to the global one, and it highly sensitive to adjustable parameters that may highly change the performance of the algorithm. In this talk, an Unsupervised Particle Swarm Optimization (UPSO) algorithm is proposed that highly improve the reliability, cost, and robustness of PSO. Our approach introduces new position and velocity update strategy based on the weighted gravitational force between all swarm individuals. Numerical results introduced for 10 standard benchmark problems.

2. **Jonathan Brown** and **Leah Bridgers**, SUNY Oneonta

Starting a Small Town Elementary School Math Circle

This January we started an after-school math circle at Valleyview Elementary School in Oneonta, NY. This math circle is led by two SUNY Oneonta math professors, as well as 10 SUNY Oneonta students. This talk is a report on how we started and organized the circle, our curriculum, and the challenges we have had to overcome.

3. **Scott Greenhalgh**, **Rebecca Schmidt**, **Troy Day**, Queen's University

Fighting the Public Health Burden of AIDS with the Human Pegivirus

Highly active antiretroviral therapy has revolutionized the battle against HIV/AIDS. From its current global rollout, HIV/AIDS morbidity and mortality has been greatly reduced, yet substantial interest exists in the development of new therapies to further mitigate the HIV/AIDS health burden, and to inhibit fallout from the development of antiretroviral drug resistance.

One potential therapy under recent deliberation is the Human Pegivirus (HPgV). HPgV is a virus that does not cause disease, and most remarkably is clinically shown to delay the progression of HIV to AIDS.

In this talk, we illustrate the utility of HPgV biovaccination for mitigating the health burden of AIDS using mathematical models. Our results show that, even in the face of HPgV virulence evolution, HPgV inoculation can be an effective therapy for reducing AIDS morbidity and mortality.

4. **Marvin Gruber**, RIT

Using the Cauchy-Schwarz Inequality to Compare the Efficiency of Regression Estimators

We will review the Cauchy Schwarz inequality; show how it is used to obtain an important result (Farebrother's (1976) result); show how this result is used to compare the efficiency of shrinkage estimators; explain why these estimators are important; and explain how the methods of this talk are being used in the recent literature.

5. **Jingxian Hu**, Hamilton College

The Effect of Demographic Factors on Hourly Wages

The relationship between hourly wage and demographic factor are of practical relevance, perhaps even moral significance. Research reveals that work experience, education, marital status, gender, demographic factors all contribute to the major differences among individuals' incomes. In this paper, I will identify the demographic characteristics involved in determining hourly wage.

6. **Bonnie Jacobs**, RIT

Distance Swap Graphs

The distance between vertices u and v in a graph G with vertex set $V(G)$ and edge set $E(G)$, $d_G(u,v)$, is the number of edges on a shortest path from u to v . Given a graph G , we pose the following question. Does there exist a graph G' with vertex set $V(G') = V(G)$ such that $d_{G'}(u,v) = 1$ if and only if $d_G(u,v) = 2$, and $d_{G'}(u,v) = 2$ if and only if $d_G(u,v) = 1$? For most graphs, of course, the answer is no. For graphs such as C_5 for example, the answer is yes. We produce a list of graphs that have this property, describe a characterization under particular constraints, and also present some related open questions.

7. **Jobby Jacob**, RIT

Graph Labeling Based on Distance One and Two

The $L(2,1)$ labeling, introduced by Griggs and Yeh, is a vertex labeling motivated by the channel assignment problem. A generalization, $L(h,k)$ labeling, is a vertex labeling in which labels of adjacent vertices differ by at least h and labels of vertices that are at distance two differ by at least k . The span of an $L(h,k)$ labeling is the difference between the largest label and the smallest label. The $L(h,k)$ span of a graph is the smallest span of all $L(h,k)$ labelings of the graph. This talk will discuss the span of graphs obtained by removing a maximum matching, or the edges in an arbitrary path from complete graphs. We will also discuss $L(h,k)$ labelings of graphs obtained by removing the edges of an arbitrary path from complete bipartite graphs.

8. **Jonathan Lopez**, Canisius College,

Graph Coverings and the ABCDEFG Classification

The ABCDEFG classification first appeared in the context of semi-simple Lie algebras over the complex numbers. We want to examine this classification entirely within graph theory. In previous work, we studied the ADE-series of graphs, which can be used to classify symmetric $0,1$ matrices with operator norm less than 2. Consideration of the full ABCDEFG-series involves the study of non-symmetric matrices that may have entries other than $0,1$. Our goal is to describe a relationship between the full series of graphs and the ADE-series, namely, that every graph in the ABCDEFG-series is covered by a graph from the ADE-series. A graph covering is a graph morphism f with the following property: for each node x in the domain, f is bijective on the set of arcs emanating from x . We also develop some of the consequences of these coverings.

9. **Yozo Mikata**, Bechtel

Graphene Self-Folding Problems

In recent years, there has been a huge amount of interest in graphene as mechanical, electrical, and bio-electrical materials. Whatever the application, it is important to understand its enormous mechanical flexibility. The approach taken in this paper is based on an energy method, which has been developed by Mikata (2005, 2006, 2007, 2010, 2013) originally for carbon nanotubes (CNT's). The central issue in the self-folding problem is to determine the minimum threshold length of the graphene at which it becomes possible for the graphene to self-fold due to the van der Waals force. In order to tackle this problem, two sub-problems have to be solved: large deformation and minimization problems. In this paper, a mathematical model is developed for a large deformation problem of self-folding as an Euler's elastica problem, and it is solved exactly using elliptic functions and elliptic integrals. Key analytical results and some numerical results will be discussed.

10. **Jason R. Morris**, SUNY Brockport

Familiar (and less familiar) Function and Sequence Spaces

It's a pleasant surprise when you find out that you can do arithmetic with sequences just as if they were vectors in 2D or 3D. But you can do more than just vector arithmetic. You can make sense of magnitude and inner products, and you can perform linear operations on sequences. You can even have a sequence of sequences that converges (to a sequence, of course)! The choice of how to measure magnitude has consequences, and different choices lead to classical sequence spaces, such as ℓ^∞ , c , c_0 , ℓ^1 , ℓ^2 , and ℓ^p . These are introduced, and some of their properties are considered. Then we can get to the "less familiar" part: does it make sense to have $\ell^{(p_n)}$ where p_n itself is a sequence? The continuous analogs L^p and $L^{p(\infty)}$ will also be introduced. (The underlying norm in these spaces is called the Luxemburg-Nakano norm. It was co-developed by Hidegoro Nakano, the father of our late colleague Kazumi Nakano.)

11. **John Myers**, SUNY Oswego

Secrets of Curve Singularities

Draw a curve on a piece of paper. Does the curve cross itself at some point? Does it have any sharp corners or cusps? Those types of points are called singular points, the others are smooth points, and mathematicians have studied singular points of curves for a very long time. But, your curve may have a secret: It may have singularities that are (partly) hiding in high dimensions. This talk aims to reveal some of these secrets of plane curve singularities, with the only prerequisites being a familiarity with the Cartesian plane and complex numbers.

12. **Sam Northshield**, SUNY Plattsburg

Conway Topographs: from Fermat's two-square theorem to graph periodicity to the rascal triangle.

John Conway introduced a concept of "topograph"; a 3-regular tree in the plane with faces and edges labeled by numbers that satisfy certain relations. Using these, we give a new proof of Fermat's theorem that primes congruent to 1 mod 4 are sums of two squares. Just as a periodic sequence can be thought of as the lift of a function on a cycle up to a 2-regular tree, we can say a numbering of a topograph is periodic if it is the lift of a function on a finite (3-regular) graph up to the topograph. We give some examples of numbering schemes that must be periodic. We consider other number schemes as well, one of which, when put on the hexagonal grid, gives rise to the "rascal triangle".

13. **Gregory Quenell**, Plattsburg State University

RSA Cryptography in the Textbook and in the Field

The RSA trap-door function that we study in Number Theory can be used to encrypt messages for secure communication. Or can it? We consider how "textbook RSA" stands up against modern definitions of cryptographic security, and show how RSA is used in an encryption system that is considered secure.

14. **Robert Rogers**, SUNY Fredonia

Riemann Sums Should be Taught at the End of Integral Calculus, Not in the Beginning

The typical calculus course/book begins integration with a complicated definition involving limits of Riemann sums, even though integration and the Fundamental Theorem of Calculus were being utilized 130 years before Riemann's birth. See how the topics of integral calculus can be rearranged to better reflect its historical development and, more importantly, to help improve our students' ability to apply integration to solving problems. I will include materials developed while teaching with this approach.

Larger Discussion Sessions

1. **Jennifer Biermann**, **Leah Bridgers**, SUNY Oneonta, **Deanna Haunsperger**, Carleton College, **Katelynn Kochalski**, SUNY Cortland, **Elizabeth Wilcox**, SUNY Oswego

Discussing A New Inclusion-Exclusion Principle: Just Include.

How can the mathematics community be more inclusive of women and of traditionally under-represented groups? Much progress has been made to include women and traditionally under-represented groups, but the process is not something that can be declared finished -- especially because much of that progress hasn't been brought home to the broad collection of individual programs, institutions, and schools but instead has been focused on summer programs or specific mathematics programs. Inclusion continues to be big challenge to members of the math community individually and at a variety of levels -- and we all know that when faced with a challenging problem, the hardest part is figuring out how to start addressing the problem ourselves. But we can't afford to be stymied into inaction: too many people already have negative attitudes towards mathematics; let's work on this together! In this session, we will brainstorm ways to open the mathematics community doors even wider.

Group discussions will focus on brainstorming steps that departments and our section can take to broaden inclusion.

2. **Mihail Barbosu**, RIT

Leadership in the Mathematical Sciences

We will discuss how to access and support student success.

Teachers' Masters Capstone Projects in Secondary and College Mathematics
Session Organizer, Keary Howard, SUNY Fredonia

Abstract:

These sessions are highlighted by the presentation of research results from secondary school mathematics teachers Masters' theses. Topics and presenters include:

Session 1 (25 minutes)

Middle and High School Student Misconceptions in School Mathematics

Sarah A. Mannion, Northern Chautauqua Catholic School:

A Study of Eighth Grade and Pre-Calculus Students and Their Misconceptions of Exponents and the Order of Operations

This research examines the misconceptions that students have when completing mathematical problems that include the laws of exponents and the order of operations. Students may have a reasonable understanding of the laws of exponents however, when combined with the order of operations this may confuse students and this confusion may lead them to incorrect results. It is hypothesized that eighth grade and pre-calculus college students will have similar misconceptions while solving mathematical problems that involve exponents and the order of operations.

Samantha Nickerson, SUNY Fredonia:

The Effects of Mathematical Vocabulary and Notation on Student Learning

This research examines the effects that mathematical vocabulary and notation have on students' outcomes in middle school and college mathematics classes. It is hypothesized that students will generally lack foundational understanding of key mathematical vocabulary in both geometry and algebra. In addition, it is predicted that both cohorts will exhibit similar deficiencies regardless of the age and educational differences.

Session 2 (25 minutes)

College Student Misconceptions in Secondary School Mathematics

Dakota Morano, SUNY Fredonia:

An Exploration of Situated Cognition and Physical Context within the Statistics Classroom

This study explores situated cognition within the statistics classroom. It is hypothesized that college students taking a statistics course will perform better if the statistics problems connects to their social, cultural, and/or physical lives. It is also hypothesized that isomorphic problems in context will outperform numeric problems.

Michelle E. Persaud, SUNY Fredonia:

An Analysis of Student Conceptual Understanding of Unit Circle and Right Triangle Trigonometry

This research examines students understanding of foundational trigonometry using a right triangle and the unit circle. Despite the fact that unit circle trigonometry historically preceded right triangle trigonometry, it is hypothesized that college students will demonstrate a higher level of understanding of trigonometry through right triangle problems, likely due to the fact that right triangle trigonometry problems are taught prior to unit circle trigonometry problems.

Session 3 (25 minutes)

College Student Misconceptions in Differential Calculus

Emily Fay, SUNY Fredonia:

Derivatives Deficiencies: An Analysis of College Students' Misconceptions Regarding Derivatives and their Applications

This research investigates why students encounter difficulties when solving calculus problems, especially those involving derivatives. Specifically, it examines the misconceptions students have solving calculus problems involving various derivative rules when they are combined or put in context. It is hypothesized that varying levels of calculus students (University Calculus I and II, Survey of Calculus I and II, University Calculus III) will make similar procedural and conceptual mistakes on problems involving derivative rules such as product, quotient and chain rule. Furthermore, students will make procedural and conceptual mistakes when said derivative rules are part of a more complex differentiation problem (i.e. multiple derivative rules are involved or in contextual examples involving the derivative).

Student Talk Abstracts

Michelle Ade-Browne, The College at Brockport

Averaging Approximations of Integrals (Poster)

Abstract: We take the usual methods of approximating integrals (midpoint, trapezoid, Simpson's) and we average them in many ways (arithmetic, geometric, harmonic, logarithmic) for various functions to see if the average is a better approximation.

Daniel Akimchuk, Ithaca College

The Behavior of Rational Squares

Abstract: In his 2015 paper, *On The Distribution of Rational Squares*, Michael Weiss explores the behavior of rational squares - numbers that can be written in the form $(\frac{p}{q})^2$ for integers p and q - particularly which rational squares fall between certain consecutive integers. As a continuation of his research, we examined many patterns associated with these numbers, especially the connection between the size of the denominator and their distribution. Looking at the set of denominators that are part of a rational square that falls between two given consecutive integers n and $n + 1$, we were able to uncover properties regarding the distribution of the rational squares. In addition to this, we explored the minimum value σ of this set for given n , as depicted in the graph of $\sigma(n)$ vs. n , which proved to be full of patterns.

We prove that a square root function upper bounds the graph, all values of $\sigma(n)$ will be greater than 2, and also formulas for $\sigma(n)$ for certain patterns of n . We also look at the set Σ^c of denominators greater than the minimum that do not have a numerator allowing the square to fall between two certain consecutive integers. The size of this set proves to be very interesting, as there are certain patterns of integers that cause this set to be empty. Because a rational square with a given denominator, q , will produce an integer square once every q numerators, the set of squares is effectively "compressed." We explore how this manner of "compression" determines which rational squares fall between which integers. Do all of the patterns that emerge in rational squares have counterparts when raising rational numbers to the third, fourth, or k -th power? Is there ever more than one rational number with denominator q that fall in between the same consecutive integers? If so, how can we determine how many/which numerators will satisfy this? Which consecutive integers can a rational square with denominator q fall between? We explore these questions to better understand the behavior of rational squares.

Jonathan Backus, SUNY Oswego

Applying Board Tilings to Solve Counting Problems

Abstract: In this talk, we introduce the following counting problem. Consider 4 six-sided dice. In how many ways can we roll the dice and observe a particular gap or difference between any pair of dice? We then introduce the stars-and-bars counting technique, and translate the problem into an equivalent counting problem for the tilings of a board. We develop a sequence of different boards for each particular difference, and then analyze how those boards are used to answer our original question. The methods used involve binomial coefficients, partitions, and other counting techniques.

Amanda Bartolotta, The College at Brockport

Comparing Areas Inside a Circle (Poster)

Abstract: We place 8 equal circles equally spaced inside a circle twice as big and we determine that certain areas are equal. This was previously known for 4 circles.

Michael Berezny, Victor Braescu, Andrew Lewis, Eric Pareis, Art North
Rochester Institute of Technology
Small Spacecraft Solar Propulsion (Poster)

Abstract: In the future, where traveling through space becomes mainstream, a Solar Sail could allow spacecraft to be propelled via the sun's rays instead of the traditional rocket propellant fuels. Solar sails use the sun's rays as a method of propulsion by harnessing the momentum carried by these partials to propel the vehicle forward. They can be used to accelerate interstellar craft to high velocities, maintain geosynchronous orbit, and to de-orbit space debris. Combined with CubeSats, small modular satellites, this technology has the potential to revolutionize space travel. The goal of this project was to design and manufacture a simple, cost effective mechanism to deploy a solar sail from within a CubeSat.

Ashley Case, The College at Brockport
Multivariable Inequalities using Lagrange Multipliers (Poster)

Abstract: We'll show how to use Lagrange Multipliers to prove multivariable inequalities.

Michael Champlin, The College at Brockport
Variations of Simpson's Method (Poster)

Abstract: Simpson's method works only for an even number of intervals. We will discuss how it can be extended to the case of an odd number.

Alexander Dennis, Hamilton College
Guardians of the Gallery

Abstract: Given an art gallery shaped as a polygon of n vertices, what is the smallest number of stationary guards needed to protect it? First proved in 1975, the art gallery theorem states that it is sufficient, although not always necessary, to have $n/3$ guards for any arbitrary polygon. We explore two proofs of this result, one based on geometric induction and the other based on graph coloring.

Peter DeWeirdt, Hamilton College
Nothing but Elastic-net: NCAA Tournament Prediction Using Penalized Regression

Abstract: First we outline theoretical considerations when fitting a penalized regression, and compare the lasso, ridge, and elastic-net penalties. Then we use a simulation to address theoretical concerns about the elastic-net penalty. Finally, we apply the elastic-net to predict win probabilities for the 2018 NCAA tournament.

Luke Duttweiler, The College at Brockport
The Maximum is not a Kernel Function (Poster)

Abstract: It is known that the minimum function is a kernel function generating a reproducing kernel on some Hilbert space of functions. We are looking at the maximum function to show that it is not a kernel function.

Abraham Glasser and Emily Lederman, RIT
Failed Power Domination: Computational Results, Extreme Values, and Complexity

Abstract: Phase Measurement Units (PMUs) are sometimes used to monitor electric power networks. To minimize cost, companies strive to minimize the number of PMUs on the network. The power domination number of a graph, $\gamma_p(G)$, was introduced and studied to determine the minimum number of PMUs needed on a given graph. We introduce and investigate a related parameter that we call the failed power domination number of a graph, $\bar{\gamma}_p(G)$. The failed power domination number of the graph gives the worst-case scenario: the maximum number of PMUs we could place on the network and still fail to completely monitor it. We characterize graphs with high values of this parameter, and present a conjecture for the list of graphs with $\bar{\gamma}_p(G) = 0$, which is interesting because a single PMU placed anywhere on the network can successfully monitor it. We also establish $\bar{\gamma}_p(G)$ for some classes of graphs and prove NP-completeness.

Kellie Halladay, SUNY Fredonia*A New Approach to Optimal Solution of Rubik's Cubes with Half Turns*

Abstract: How many moves are required to solve a Rubik's cube in the quickest way possible? There is a method for finding the maximum number of moves to solve a Rubik's cube in the minimum number of steps. This number is known as God's number. We will consider finding God's number in the case where we only allow 180 degree turns on the cube. Is the size of the cube a factor in determining the optimal number of moves needed? Take a $2 \times 2 \times 2$ Rubik's cube, for example. It seems that this cube would require less moves than a $3 \times 3 \times 3$ to solve. How do these 2 cubes compare? Are there Rubik's puzzles that are larger than a $2 \times 2 \times 2$ but smaller than a $3 \times 3 \times 3$? Yes, and these intermediate steps in between the $2 \times 2 \times 2$ and the $3 \times 3 \times 3$ are vital to the analysis of the $3 \times 3 \times 3$.

Sarah Hoover, Hamilton College*Measuring Fairness: The Mathematics of Gerrymandering*

Abstract: Gerrymandering is the practice of drawing district lines with an eye towards advantaging one political party over another. With the 2020 Census on the horizon numerous upcoming Supreme Court cases, gerrymandering is a hot-button issue. Mathematicians have developed several metrics to determine the degree of 'fairness' of districting plans, most notably compactness and the efficiency gap. We discuss the rationale behind these metrics while examining their strengths and limitations through various examples of district maps. With the aid of topology and convex geometry, we also demonstrate map-drawing techniques that may allow gerrymandering to remain undetected by traditional methods.

Jingxian Hu, Hamilton College*The Effect of Demographic Factors on Hourly Wages*

Abstract: The relationship between hourly wages and demographic factors are of practical relevance, perhaps even moral significance. Research reveals that work experience, education, marital status, gender, demographic factors all contribute to the major differences among individuals' incomes. In this paper, I will identify the demographic characteristics involved in determining hourly wages.

Jichen Huang, Hamilton College*Non-isomorphic Spanning Trees of Graphs*

Abstract: In a connected graph G , it is (usually) easy to find a tree that contains all the vertices and some edges of G ; such a subgraph is called a spanning tree. With the Matrix tree theorem, we can determine how many spanning trees a graph contains. Looking at the proof of that theorem, it even seems not very difficult to find all those spanning trees (which also can be done in other ways). But what can we say about the isomorphism classes of the spanning trees? How many and which non-isomorphic spanning trees does the graph contain?

In this talk, we will look at trees and graphs from different points of view, trying to discover properties which can tell us something about two graphs being isomorphic or not. This since we want to partition the set of spanning trees into isomorphism classes.

Then I will present an algorithm that determines all the non-isomorphic spanning trees of a given graph. Now, we can determine all the non-isomorphic spanning trees of a graph. But maybe there exists a formula which tells us how many there are. For an arbitrary graph, it is hard to determine such a formula. However, for bipartite graphs it seems doable. Next I will take a look at earlier results and use them to determine a formula for the number of non-isomorphic spanning trees of $K_{4,t}$.

Narges Iraj, SUNY Plattsburgh*Modeling Cadmium Concentration in Human Body*

Abstract: Chronic and long-term exposure to cadmium has a number of health effects. So it would be beneficial to have a model of cadmium concentrations in the body. In this talk, I will describe a new mathematical model to predict the concentration of cadmium in the human body based on cadmium in the diet. The system of differential equations is based on current knowledge of body cadmium storage and on available cadmium excretion data. I'll describe efforts to solve the equations, find approximate values for the unknown coefficients, and graph the results using a computer program. Finally, I'll describe future adjustments to include other factors, such as intake via the respiratory system from smoking.

Brielle Kwart and Ben Reber, Houghton College*Optimal Growth Allocation in *Sarracenia purpurea* in Varying Environments*

Abstract: *Sarracenia purpurea*, also known as the Northern Pitcher plant, is a perennial carnivorous plant found in nutrient poor bogs in the Eastern part of the United States, the Great Lakes region, and most of Canada. *S. purpurea* has modified pitcher-shaped leaves which collect prey and rainwater for nutrient consumption, with nitrogen being the most important nutrient, and rainwater being the primary means of obtaining it. These modified leaves are photosynthetically less efficient than other leaf structures (phyllodia) that are produced by the plant. *S. purpurea* is phenotypically plastic, and so the plant can allocate growth between carnivorous and non-carnivorous structures depending on environmental nitrogen conditions. Previous research has shown that an increase in phyllodia production is a direct and rapid response to nitrogen availability. Using optimal control theory, we created a model to show optimal growth allocation of *S. purpurea* in such a way that plant morphology represents a prediction of atmospheric nitrogen levels. Our model predicted a difference in carnivorous to non-carnivorous biomass ratios given different nitrogen uptake rates.

Elise LePage, Hamilton College*Calculating Clebsch-Gordan Coefficients Using Young Tableaux*

Abstract: In physics, a quantum state consisting of multiple particles is given as the tensor product of elements of the group $SU(N)$, which correspond to the state of each particle. This tensor product of group representations can be decomposed into a sum of irreducible representations using Clebsch-Gordan coefficients. I will present a method for calculating the Clebsch-Gordan coefficients for $SU(N)$ using Young Tableaux and present an example calculation for $SU(3)$.

Shoshanna Longo, Rochester Institute of Technology*Approximate Solutions to Lane-Emden Equation for Stellar Configuration (Poster)*

Abstract: Analytical solutions to a Lane-Emden initial value non-linear model used to describe the thermal behavior of a spherical cloud of gas acting upon the mutual attraction of its molecules is observed. The Homotopy Analysis Method (HAM) is used to obtain a convergent series solution to the model equations. The choice of linear operator and initial value is looked at and shown to affect the interval of convergence to the series solution.

Shane Merritt, The College at Brockport*An Integral Limit (Poster)*

Abstract: We will discuss ways to compute limits of integrals in the case when the convergence theorems from Real Analysis do not apply.

Molly Noel and Noelle Sullivan, Ithaca College*Extension of Kaprekar's Algorithm to Arbitrary Bases*

Abstract: Kaprekar's Algorithm was developed in 1949 by D.R. Kaprekar. One takes a 4 digit number in base 10 and creates two new numbers, one with the digits of the original number in descending order and the other with these digits in ascending order. Then one subtracts the number with digits in ascending order from the number with digits in descending order. The algorithm shows that repeating this process will always converge to 6174 no matter what the originating number.

For 3 digit numbers in an arbitrary base n , we found that all Kaprekar numbers were of the form $[\alpha - 1][n - 1][n - \alpha]$, where n is the base and α is the difference between the largest and smallest digit. We were also able to prove that when n is even, the algorithm converges to one fixed point, and we can compute this fixed point. We proved that for odd bases, the algorithm always converges to a cycle of two numbers, and we can compute these two numbers.

Other work includes generalizing the Kaprekar algorithm for 4 digit numbers in an arbitrary base. We plan on looking at cycles for 4 digit numbers in arbitrary bases. We hope to find similar patterns like we did with the 3 digit cases. So far we know that we are not going to be able to generalize the 4 digit cases as even and odd like we did with the 3 digit case.

Virtee Parekh, Rochester Institute of Technology*Artificial Intelligence for Machine Health Prediction*

Abstract: In this work, we use artificial intelligence algorithms for early prediction of machine failure. First, raw data is collected from a monitoring device: an instance of data consists of a time stamp and several parameters like temperature, pressure, kurtosis, etc. Then, the dataset is split into binary classes - either in failure or not - by comparing each instance of the current dataset with instances from legacy datasets of machines that have previously failed. Sampling techniques are used to balance the data if it is skewed, and once the dataset is prepared, cross-validation is performed to divide the dataset into training and testing data. Finally, supervised learning algorithms like Naïve Bayes classifier, random forest, support vector machine, etc. are implemented. Once the model is trained, the testing data is run against the model, while the confusion matrix and the accuracy are computed as measures of performance.

Gabriella Pesce and Samantha Todres, Ithaca College*A Two Piece Puzzle...How Hard Could it Be?*

Abstract: A polyomino is defined as a plane geometric figure made up of one or more equal squares joined edge to edge; polyominoes appear in pop culture as playing pieces in the games of Dominoes and Tetris. We are studying polyominoes that can tile rectangles with two copies, where two polyominoes are considered the same if they differ by a rotation. Our results allow us to count the number of polyominoes that can tile a rectangle with dimensions $2N \times 2M$ or $(2N + 1) \times 2M$ with only two copies, where M and N are positive integers. The process of counting these polyominoes involves matching different polyomino shapes with integer sequences. These integer sequences are constructed by counting the number of blocks that occur in each column of a polyomino. In many cases, a polyomino can be represented by more than one integer sequence. We will detail our method for discarding these excess shapes; this will then allow us to enumerate all polyominoes that can tile a rectangle of any specified dimension using two copies.

Abbas Rehmani, Rochester Institute of Technology*Diffusive Substrate Flux Approximation Analysis to 1D Biofilm Modeling*

Abstract: We present an analytical approximation for the diffusive flux of a substrate into a reactive layer, in which the substrate is degraded according to Monod kinetics. The study of 1D biofilm model with the limited growth assumption is based on a calculation for a diffusive substrate flux from a two-point boundary value problem. The approximation is derived through a modified Adomian Decomposition Algorithm and verified computationally, by comparison against a shooting method numerical scheme. Simple analytical approximation eases the study for a 1D biofilm model.

Chelsea Soprano, The College at Brockport*Comparing Areas Inside a Circle (Poster)*

Abstract: We place 6 equal circles equally spaced inside a circle twice as big and we determine that certain areas are equal. This was previously known for 4 circles.

Wenshi Wang, Hobart and William Smith Colleges*Reducing the Dimension of Tree Space*

Abstract: There are numerical phylogenetic trees presence at a tree space with different taxa. Let the dimension of the space be the same as the number of trees, and there is an injective map. Our overall goal is to find an injection from the set of trees, to a small dimensional Euclidean space (dimension n). We use both theoretical and empirical approach to address this question. By using these approaches, we have generalized the formula for compatible splits and have proved that the reduction map to $\mathbb{R}^n$ using Robinson-Foulds distance is not injective for all collections of n -taxa benchmark trees.

Kelly Waters, The College at Brockport*Boole Method for Numerical Integration (Poster)*

Abstract: We will discuss same variations of Boole's Method of approximating integrals and will compare it with the usual methods included in Calculus classes.

Haoxiang Yang, Hamilton College*Locally Recoverable Codes: A Technique for Creating Multiple Recovery Sets*

Abstract: A code is called locally recoverable if a single erasure of the codeword can be recovered by accessing a small set of other coordinates in the codeword without the need to access the entire code. However, it is not possible to conduct the repair of information if any element in the recovery set of coordinates is unavailable. To solve this problem, mathematicians have attempted to construct multiple distinct recovery sets. Previous research has built locally recoverable codes with two recovery sets. I will present a technique for finding more than two recovery sets from the paper "Locally Recoverable Codes with Availability $t \geq 2$ from Fiber Products of Curves" by Haymaker, Malmskog, and Matthews.

AN INVITATION FOR YOUR DEPARTMENT



Announcement

The Seaway Section of the Mathematical Association of America is pleased to announce that we have selected **Dr. David Brown** of Ithaca College to serve as our very first **Distinguished Lecturer** of the Seaway Section. He has been recognized as an effective and engaging teacher and mentor to his students, earning in 2008 the Henry L. Adler Award for Distinguished Teaching. He is also a part of a five-member faculty team from Ithaca College awarded a grant to support the Robert Noyce Scholarship Program. 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 this exciting new program.

Invitation

We invite all mathematics departments in the area to apply for the opportunity to host a visit from the Distinguished Lecturer. 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, 2018:

1. An indication of your department's preference from the list of the Lecturer's prepared talks and topics (listed to the right).
2. 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.

THE DISTINGUISHED LECTURER OF THE SEAWAY SECTION

Prepared Talks:

- Revolutionary War and Civil War Spycraft – Exploration of early cryptology
- From Magic Squares to Magic Polygons – Properties and Constructions
- Fractals, Trees, and Space-filling Curves
- Mathematics of Cartography
- From Quadratic to Exponential – Introduction to Complex Dynamics

Topic Areas:

- Cryptology
- Fractal Geometry
- Complex Dynamical Systems
- Elliptic Curves
- Mathematics and Literature

The members of the
Distinguished Lecturer
Selection Committee:

Jonathan Cox
Charlie Jacobson
Jeff Johannes
Olympia Nicodemi
Gary Towsley
Elizabeth Wilcox

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