Program of Activities For the 2019 Spring Meeting of the

Mathematical Association of America

Ohio Section



Spring 2019 The University of Akron Akron, Ohio April 5 – 6, 2019

Mathematical Association of America Ohio Section

Program – Friday, April 5, 2019

Time	Event	Location
12:00-4:00	Registration	Lobby by 108
12:00-1:00	Leo Schneider Student Team Competition	111, 113, 101
12:00-1:00	Committee Meetings:	
	CONCUR (Curriculum)	226
	CONSACT (Section Activities)	321
	CONTEAL (Teacher Education & Licensure)	424
1:00-4:00	Vendor & Book Exhibits	Lower Lobby
1:30-1:45	Welcome and Announcements	108
	Invited Address: Shawn D. Ryan	
1.45-2.45	Mathematics Provides Insight into	108
1.45-2.45	Self-Organization in Biology	100
	(Abstract A)	
2:45-3:15	Break	Lower Lobby
	Invited Address: Carl Mummert	
3.15-4.15	Counting down from	108
0.10 1.10	Infinity, and TREE(3)	100
	(Abstract B)	
4:25-6:05	Executive Committee Meeting	SU 307
4.45-6.20	Contributed Paper Sessions	101, 103,
4.43 0.20		111, 113
6:20-7:00	Social Time	SU 312
7:00-8:00	Student Pizza Party	SU 335
7:00-8:00	Banquet	SU 312
	Invited Address: Adam Parker	
8:00-9:00	Being Rational about	SU 312
	Algebraic Numbers	50 512
	(Abstract C)	
9:00-	Business Meeting and the	SU 312
	Presentation of Teaching Award	00.012

Unless specified otherwise, all locations are in Zook Hall. SU abbreviates "Student Union".

Program – Saturday, April 6, 2019

Time	Event	Location
8:00-10:00	Registration	Lobby by 108
8:00-10:00	Book Vendors and Exhibits	Lower Lobby
8:00-8:50	Coffee and Pastries	Lower Lobby
8:15-8:50	Committee On Local Arrangements	226
8:15-8:50	Executive Committee Meeting	SU 307
	(if needed)	
9:00-9:10	Welcome and Announcements	108
	Student Competition Results	
	Invited Address: TaraLee Mecham	
9:10-10:10	Secret Lives of Mathematicians	108
	(Abstract D)	
10:10-10:30	Break	Lower Lobby
10:30-11:45	Contributed Paper Session	101, 103, 111
11:45-12:00	Break	Lower Lobby
	Invited Address: Susan Jane Colley	
12:00-1:00	Counting Curves: Tales from	108
	the Enumerative Crypt	100
	(Abstract E)	
1:00-1:10	Closing Remarks	108

Unless specified otherwise, all locations are in Zook Hall. SU abbreviates "Student Union".

Abstracts and Bibliographies for Plenary Speakers

Friday Invited Addresses

Speaker: Shawn D. Ryan

Title: Mathematics Provides Insight into Self-Organization in Biology

Abstract A: In this talk we will consider how mathematical modeling, analysis, and simulation can be used to provide new insight into biological phenomena. In particular, we focus on the self-organization of large-scale groups of insects and bacteria. What makes this problem interesting is that individual interactions at the microscale lead to the onset of mesoscale and then macroscale patterns. In addition, when animals exhibit collective behavior one can observe remarkable properties such as enhanced movement speed, pattern formation, and increased mixing. A deep understanding of how and why these properties emerge is fundamental to pressing biological problems such as the design of microscale devices and biomaterials, treating algal blooms in Lake Erie, or preventing neurodegenerative diseases. Throughout the talk we will use mathematics to explain the underlying mechanisms that lead to these incredible features. By the end we will answer an age-old question "Is 2 > 1?", for biological systems the answer is yes!



Biography: Shawn Ryan has taught at Cleveland State University since 2016. He grew up in Northeast Ohio (Mentor) and received his Bachelors and Masters degrees in Applied Mathematics from the University of Akron in 4 total years. He then earned his Ph.D. at Pennsylvania State University studying Mathematical Biology and PDEs in 2014. During his time as a Ph.D. student at Penn State, Shawn received the Department of Mathematics Outstanding Teaching Award as well as The Pritchard Dissertation Award for the most Outstanding

Mathematics Ph.D. Thesis. Following this time, Shawn spent two years as an interdisciplinary postdoctoral research scholar at Kent State University in the Department of Mathematical Sciences and the Liquid Crystal Institute designing computational algorithms for studying foam coarsening and pattern formation in liquid crystals. His active areas of research include self-organization in biological systems, bacterial contamination in the food industry, biomedicine, and material science. He has directed fifteen undergraduate and two honors undergraduate senior theses as well as four Masters exit projects. Shawn enjoys spending his free time with his wife Ashley, a pediatrician at Akron Children's Hospital, and his two daughters Nora and Eliza.

Friday Invited Addresses

Speaker: Carl Mummert

Title: Counting down from Infinity, and TREE(3)

Abstract B: One area of combinatorics looks at specific sequences of natural numbers that grow at seemingly inconceivable rates. We will begin with the sequence TREE(n) and Kruskal's theorem, a related result about the combinatorics of finite trees. We'll encounter the specific number TREE(3), once described by Popular Mechanics as "too large to notate directly, too large to comprehend, too large for physics to describe". We'll see the process of "miniaturization" that transforms pure existence theorems like Kruskal's into fast-growing sequences like TREE(n). Then we'll look at a "base infinity" number system in which each "digit" can be arbitrarily large. We'll see that counting down to 1 from a base infinity number is not as easy as it sounds.



Biography: Carl Mummert is an Associate Professor of Mathematics at Marshall University. An Appalachian native, he attended Western Carolina University, received a PhD from Penn State, and held postdoctoral positions at Appalachian State and the University of Michigan. His research is in mathematical logic (particularly Reverse Mathematics and computability theory), topology, and combinatorics. He has supervised numerous student research projects, and has several co-authored papers with students. His teaching incorporates techniques

from Inquiry Based Learning (IBL), and he is the current Program Officer of the MAA IBL SIGMAA. He is also an active member of the Digital Humanities group at Marshall.

Friday Invited Addresses

Speaker: Adam Parker

Title: Being Rational about Algebraic Numbers

Abstract C: There is a classic algorithm known to Theon of Smryna in about 130 AD that approximates $\sqrt{2}$ by a sequence of rational numbers. In May 2016, Daniel Vargas, then in 7th grade, noticed a similar process seemed to approximate $\sqrt[p]{k}$. Indeed, in October of that year, I gave a talk at the Ohio Section meeting asking if anyone had seen Daniel's process before. While attempting to prove Daniel's result, we were able to generalize these ideas to construct recursively defined sequences of rational numbers that converge to any given algebraic number, not just *p*th roots. This is joint work with Daniel Vargas and the Ohio Section's very own Matt Davis of Muskingum University.



Biography: Adam Parker is Professor of Mathematics at Wittenberg University in Springfield, OH. He received B.S. degrees in Mathematics and Psychology from the University of Michigan in 1999, followed by his Ph.D. in Algebraic Geometry from the University of Texas at Austin in 2005. While still interested in Algebraic Geometry, he is happy to work with students on any project of

their interest. A sepia dot in (1996-1997) Project NExT, he has been involved in several parts of the MAA, particularly the Ohio Section where he has chaired the Curriculum Committee (CONCUR) and the Program Committee. He has won Wittenberg's Omicron Delta Kappa Teaching Award, Witt's Alumni Distinguished Teaching Award, and the Southwestern Ohio Council for Higher Education's (SOCHE) Excellence in Teaching Award twice. Last year he was particularly humbled to receive the Ohio Section of the MAA Distinguished Teaching award. He teaches a wide range of courses and often incorporates primary sources in his teaching. He won the 2014 Polya award for a paper that evolved from using original sources in an ODE course. In his spare time, he enjoys sports, cooking, repairing old mechanical watches and spending time with his dog, Rosie.

Saturday Invited Addresses

Speaker: TaraLee Mecham Title: Secret Lives of Mathematicians

Abstract D: Mathematics can be more than just a subject in school; it can be a career. The government is the number one single employer of mathematicians in the country. Many of those mathematicians end up at the National Security Agency, where they find careers in research, information assurance, and crypt-analysis. This talk will be an introduction to the roles of mathematicians at NSA, as well as basics of cryptography.



Biography: TaraLee Mecham received her Ph.D. from the University of Oklahoma in 2009, studying geometric group theory. Before starting her career at the NSA, Tara worked at the College of St. Joseph from 2009 to 2011, as well as being a National Project NExT fellow (a green dot). Tara is affiliated with the Women in Mathematics Society (WiMS) at the NSA, whose mission includes improving NSA's outreach to the academic community and

enhancing the career development of women mathematicians at the Agency. WiMS financially supports a number of programs for women in mathematics. One of its most successful ventures has been the MathNet program, a program matches volunteers at NSA with newly hired mathematicians in an effort to ease the transition of new hires at the Agency. WiMS also works jointly with another Agency program called the Mathematics Education Partnership Program (MEPP), which promotes mathematics and science education at non-profit educational institutions, particularly at the K-12 level.

Saturday Invited Addresses

Speaker: Susan Jane Colley

Title: Counting Curves: Tales from the Enumerative Crypt

Abstract E: We will consider the Steiner problem (1848) of five conics: to determine how many conics are simultaneously tangent to five others. We will review some of the history surrounding this problem and some of the ingredients needed to solve it. Finally, we'll speed ahead to modern times and briefly sketch joint work with Gary Kennedy (Ohio State) and Lars Ernström (Ericsson) that uses mathematical techniques inspired by ideas in theoretical string theory to address some analogous questions about "higher-order" contact of plane curves.



Biography: Susan Colley is the Andrew and Pauline Delaney Professor of Mathematics at Oberlin College and currently the Editor of *The American Mathematical Monthly*. She received her B.S. and Ph.D. degrees from MIT in the previous century. Her research interests lie in algebraic geometry and related areas; students may

know her from her textbook Vector Calculus, 4th ed. Pearson, 2012 and curse her accordingly.

Schedules for Contributed Sessions

Contributed Paper Session A - Zook 101

Friday, April 5, 2019

4:45pm to 6:20pm

Session Chair: Avishek Mallick

4:45 to 5:00	Solving Korteweg-de Vries (KdV) Type Equation by Using Method of Approximate Particular Solutions (Abstract 1) Anup Lamichhane, Ohio Northern University
5:05 to 5:20	Multivariable Data Fitting by Using Radial Basis Function (Abstract 5) Jack Raney*, Ohio Northern University
5:25 to 5:40	Force Propagation in a Multi-Rod Drumstick (Abstract 9) Bradley Lockhart*, Ohio Northern University
5:45 to 6:00	Perfect Numbers in Other Bases (Abstract 13) Brandon T Eschborn*, Edinboro University of PA
6:05 to 6:20	Markov-Modulated Fluid Flows (Abstract 17) Barbara Margolius, Cleveland State University

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Contributed Paper Session B - Zook 103

Friday, April 5, 2019

4:45pm to 6:20pm

Session Chair: Irina Chernikova

4:45	Bringing Data Science to Marketing: Why Is It So Hard?
to	(Abstract 2)
5:00	Tim Wilson, Search Discovery
5:05	Bringing Data Science to Marketing: Why Is It So Hard?
to	(Abstract 6)
5:20	Tim Wilson, Search Discovery
5:25 to 5:40	Row Cyclic Latin Squares (Abstract 10) James M Waldeck*, Marshall University
5:45	Bounds on Number of Positive First Differences for
to	Lempel Costas Arrays of Odd Order (Abstract 14)
6:00	Christopher N Swanson, Ashland University
6:05	An Analysis of the Effect of Early Season Winning Percentage
to	on Final Regular Season Winning Percentage (Abstract 18)
6:20	Emily M Martin [*] , Ashland University

* Student Speaker

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Contributed Paper Session C - Zook 111

Friday, April 5, 2019

4:45pm to 6:20pm

Session Chair: Zijian Diao

4:45 to 5:00	An Expository Talk on the Problem of the Wallman Compactification (Abstract 3) Kevin Morrison [*] , Miami University - Oxford
5:05 to 5:20	Cut Points: A Primer on Topology (Abstract 7) Matt Bruno*, Edinboro University of Pennsylvania
5:25 to 5:40	Facets of the BME Polytope (Abstract 11) Cassandra M Durell*, The University of Akron
5:45 to 6:00	Publishing in MAA Journals (Especially the Monthly) (Abstract 15) Susan J Colley, Oberlin College

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Contributed Paper Session D - Zook 113

Friday, April 5, 2019

4:45pm to 6:20pm

Session Chair: Alfred Akinsete

4:45 to 5:00	A Random Walk with Fibonacci (Abstract 4) Gordon A Swain, Ashland University
5:05 to 5:20	Exploring the Variance of the Sample Variance (Abstract 8) Christina Y Stradwick*, Marshall University
5:25 to 5:40	Ups and Downs in the Logistic Map (Abstract 31) David Calvis, Baldwin Wallace University
5:45 to 6:00	Statistical Problems in Biomedical Research I: The Case of Spina Bifida (Abstract 12) M B Rao, University of Cincinnati
6:05 to 6:20	Statistical Problems in Biomedical Research II: The Case of Missing Data (Abstract 16) M B Rao, University of Cincinnati

Contributed Paper Session E - Zook 101

Saturday, April 6, 2019

10:30am to 11:45am

Session Chair: Matt Davis

10:30	Polynomials, Their Algebra and Their Zeros.
to	Students Learn to Construct Their Own Theorem. (Abstract 19)
10:45	Antonella Cupillari, Penn State University - The Behrend College
10:50	A Math Education Course on Gonzo Math and Factoradic
to	(Abstract 22)
11:05	Zijian Diao, Ohio University - Eastern
11:10	The Online Punch: Experiences from Online Teaching
to	(Abstract 25)
11:25	Irina Chernikova, The University of Akron
11:30	Technically Efficient: Measuring the Efficiency of Ohio
to	Universities in Teaching Mathematics (Abstract 28)
11:45	Sukanya Kemp, The University of Akron

Contributed Paper Session F - Zook 103

Saturday, April 6, 2019

10:30am to 11:45am

Session Chair: Christopher Swanson

10:30 to 10:45	Wolfram Technology in Education and Research (Abstract 20) Andy M Dorsett, Wolfram Research
10:50 to 11:05	Wolfram Technology in Education and Research (Abstract 23) Andy M Dorsett, Wolfram Research
11:10 to 11:25	A Natural Use of a Trig Identity in Calculus (Abstract 26) David Stuckey, Defiance College
11:30 to 11:45	Data Visualization with Python (Abstract 29) Moez Ben-Azzouz, Sinclair Community College

Contributed Paper Session G - Zook 111

Saturday, April 6, 2019

10:30am to 11:45am

Session Chair: Phil Blau

10:30	Modeling the Interactions between the Red Crabs and
to	Yellow Crazy Ants on Christmas Island (Abstract 21)
10:45	Nick R Baumgartner [*] , Cleveland State University
10:50	Gauze and Effect: A Mathematical Model of Wound Healing
to	(Abstract 24)
11:05	Alec DeBoard*, Cleveland State University
11:10 to 11:25	The Firefly Phenomenon (Abstract 27) Olivia Y Maslanka*, Cleveland State University
11:30	Semiprime Factorization with Numerical Approximation
to	(Abstract 30)
11:45	Pengfei Jia*, Edinboro University of Pennsylvania

* Student Speaker

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Abstracts for Contributed Papers

Friday, April 5, 2019, 4:45pm to 5:00pm

Solving Korteweg-de Vries (KdV) Type Equation by Using Method of Approximate Particular Solutions

Anup Lamichhane, Ohio Northern University

Session A - Zook 101

Abstract 1: Method of approximate particular solutions (MAPS) is one of the meshless numerical method to solve partial differential equations. In this talk, we present MAPS to solve a time-dependent nonlinear partial differential equation by solving the KdV type equation.

Bringing Data Science to Marketing: Why Is It So Hard?

Tim Wilson, Search Discovery

Session B - Zook 103

Abstract 2: In the early 1900s, John Wannamaker noted, "Half the money I spend on advertising is wasted; the trouble is I don't know which half." Ever since then – and at an accelerating pace – marketers have been obsessed with figuring out "which half." The precision, volume, and availability of digital data, combined with a siren song played by analytics vendors, has convinced marketers that "the truth" is out there: with enough data, placed in the hands of data scientists armed with machine learning algorithms, absolute truths will emerge! The reality is much more complicated, and data scientists and marketers often feel like they're talking past each other or speaking entirely different languages. This presentation will try to tease apart why this is and how we can start to address the challenge.

Friday, April 5, 2019, 4:45pm to 5:00pm

An Expository Talk on the Problem of the Wallman Compactification

Kevin Morrison*, Miami University - Oxford

Session C - Zook 111

Abstract 3: This expository talk shall define the Wallman Compactification and the Wallman Basis, and shall given an overview as to certain properties that shall be necessary for the consideration of a fundamental problem of the Wallman Compactification. The problem is as follows: suppose that *X* is a normal space. Is it then true that every Hausdorff compactification of *X* can be obtained by some Wallman base? However, the answer to this is not known. However, some limitations to the Wallman base of a compactification are known. This talk will consider one of these specific limitations.

A Random Walk with Fibonacci

Gordon A Swain, Ashland University

Session D - Zook 113

Abstract 4: A process is defined recursively on the positive integers where the random positive jump depends on the current and previous values. We calculate the mean and variance of the distribution of values at each step, and compare these to a simulation. This process is the result when each litter size in Fibonacci's Rabbit Problem is determined by a fixed probability distribution.

Friday, April 5, 2019, 5:05pm to 5:20pm

Multivariable Data Fitting by Using Radial Basis Function

Jack Raney*, Ohio Northern University

Session A - Zook 101

Abstract 5: It is often desirable to be able to interpolate data values to gain an accurate estimate at the unknown locations. There are several methods to interpolate the data in one dimension, but not all systems can be determined from one variable. One such example of this is the wind chill index to determine the safety of being outdoors in cold temperatures. While this system has an established approximation function provided by the National Weather Service, this presentation aims to provide alternative method of interpolating multivariable data using radial basis functions.

Bringing Data Science to Marketing: Why Is It So Hard?

Tim Wilson, Search Discovery

Session B - Zook 103

Abstract 6: This is a continuation of the preceding presentation.

Friday, April 5, 2019, 5:05pm to 5:20pm

Cut Points: A Primer on Topology

Matt Bruno*, Edinboro University of Pennsylvania

Session C - Zook 111

Abstract 7: A point *x* is a cut point of a connected space *X* provided that $X \setminus \{x\}$ is a disconnected subspace. We will build our topological understanding up to and including connectedness in order to prove some elementary properties and specific examples of cut points.

Exploring the Variance of the Sample Variance

Christina Y Stradwick*, Marshall University

Session D - Zook 113

Abstract 8: The goal of this research was to examine properties of the variance of the sample variance, which we will denote $V(S^2)$. We derive a formula for this variance and show that it only depends on the sample size, variance, and kurtosis of the underlying distribution. We also derive the maximum-likelihood estimators for this parameter, $\hat{V}(S^2)$, under the normal, exponential, Bernoulli, and Poisson distributions.

Friday, April 5, 2019, 5:25pm to 5:40pm

Force Propagation in a Multi-Rod Drumstick

Bradley Lockhart*, Ohio Northern University

Session A - Zook 101

Abstract 9: Multi-rod drumsticks are close-packed circular arrays of individual rods. We consider the problem of how an initial impulse propagates through such an array. As a first approximation we model the drumstick as a square array of cells and develop a set of discrete-time two-dimensional recursion relations to model the force propagation. These relations can be recast in matrix form as a summation using binomial coefficients.

Row Cyclic Latin Squares

James M Waldeck*, Marshall University

Session B - Zook 103

Abstract 10: We study the mate relationship of row-cyclic latin squares of a fixed size. A row-cyclic latin square is a square where the first column is a permutation and each row is in cyclic order. Through computer analysis, and combinatorial and algebraic techniques, we were able to completely characterize the matehood of all odd prime power sized row-cyclic latin squares by organizing them into a collection of sets of MOLS.

Friday, April 5, 2019, 5:25pm to 5:40pm

Facets of the BME Polytope

Cassandra M Durell*, The University of Akron

Session C - Zook 111

Abstract 11: The balanced minimum evolution (BME) polytope is a structural representative of a problem in biology, in particular in the study of phylogenetic trees. In this scope, the polytope is used to answer the question of how a set of species are related to one another. Here we explore specific instances of the BME polytope. For one of these polytopes we focus on the discovery of new facets and their corresponding equations, while for the other we give the facets of the polytope and discuss the relationship that they have to another well known polytope outside of the field of biology. Furthermore, we also provide the dimension reducing equalities that were discovered which hold for every BME polytope and then prove their existence.

Ups and Downs in the Logistic Map

David Calvis, Baldwin Wallace University

Session D - Zook 113

Abstract 31: The logistic map given by

 $x_{n+1} = r x_n (1 - x_n),$

with *r* a constant between 0 and 4, is well-known for its exotic behavior. When 1 < r < 3, we find that x_n converges to the fixed point $1 - \frac{1}{r}$ of the mapping. This talk will ask *how* it converges. Does it converge monotonically, or does it do significant "line jumping" on its way to its limit? The answer, it turns out, depends on the value of *r*.

Friday, April 5, 2019, 5:45pm to 6:00pm

Perfect Numbers in Other Bases

Brandon T Eschborn*, Edinboro University of PA

Session A - Zook 101

Abstract 13: Perfect numbers have fascinated mathematicians for hundreds of years. However, there are properties that may not be as well-known. This talk will explore four properties for even perfect numbers if expressed in a different number system.

Bounds on Number of Positive First Differences for Lempel Costas Arrays of Odd Order

Christopher N Swanson, Ashland University

Session B - Zook 103

Abstract 14: A Costas array is a permutation matrix such that all vectors between pairs of ones are distinct. Equivalently, a permutation matrix is a Costas array if the difference triangle corresponding to the permutation has distinct entries in each row. In this talk, I will present bounds on the number of positive entries in the first row of the difference triangle corresponding to Lempel Costas arrays of odd order.

Friday, April 5, 2019, 5:45pm to 6:00pm

Publishing in MAA Journals (Especially the Monthly)

Susan J Colley, Oberlin College

Session C - Zook 111

Abstract 15: I will briefly discuss what the Editorial Boards seek in submissions to MAA Journals (i.e., The College Mathematics Journal, Mathematics Magazine, and The American Mathematical Monthly), with particular focus on submitting to the Monthly, and concluding with some general advice and comments.

Statistical Problems in Biomedical Research I: The Case of Spina Bifida

M B Rao, University of Cincinnati

Session D - Zook 113

Abstract 12: The talk is presented in two sessions. In the first session, the birth defect 'Spina Bifida' will be outlined and how it is treated by pediatric surgeons. Some statistics associated with the defect will be presented. Current ongoing research on a treatment of the defect along with statistical challenges will be explained.

Friday, April 5, 2019, 6:05pm to 6:20pm

Markov-Modulated Fluid Flows

Barbara Margolius, Cleveland State University

Session A - Zook 101

Abstract 17: This presentation is an expository talk on Markov-Modulated Fluid Flows. Markov-modulated fluids have a long history. They were initially studied in the 1950s as a model for dams and reservoirs, more recently they have been used to study the behavior of telecommunications networks and computer systems. They have application potential in many other areas as well. These include risk in insurance, manufacturing systems, hydroelectric power generation and also in environmental studies. A Markov process is a stochastic process in which where you go next just depends on where you are. A Markov-modulated fluid flow is a Markov process described by two coordinates. One coordinate tells how much fluid there is in the system (this coordinate is non-negative and continuous) and the second coordinate has discrete values that describe phases which control the rate at which the fluid flows either in or out. In this talk, we describe how Markov-modulated fluid flows are modeled.

An Analysis of the Effect of Early Season Winning Percentage on Final Regular Season Winning Percentage

Emily M Martin*, Ashland University

Session B - Zook 103

Abstract 18: In this project, we will explore the question, "How does early season winning percentage affect final regular season winning percentage?" focusing on probability. While these theoretical results apply to any sport, we will compare them to NFL statistics. In this presentation, we will walk through the example of an NFL team that wins at least two of its first three games to calculate the probability of it winning ten of its sixteen total games.

Friday, April 5, 2019, 6:05pm to 6:20pm

Statistical Problems in Biomedical Research II: The Case of Missing Data

M B Rao, University of Cincinnati

Session D - Zook 103

Abstract 16: This is the second part of the presentation. The fetus is diagnosed with 'spina bifida.' There is an area of the spinal column through which spinal fluid is leaking into amniotic fluid. Skin is missing in the gap. A combination polymer patch has been developed to cover the gap by fetal surgery. Hopefully, skin grows under the patch covering the gap. Two questions arise: How long the patch should be left on the gap for rejuvenation of skin and measure how rough the patch is. In order to measure roughness of the patch, the patch has to be removed and in the course of measuring roughness, the patch is destroyed. The surgeon also needs to know how rough the patch was when it was created initially. One cannot have this measurement. One has to make a statistical guess of the missing value. This is challenging. A solution is proposed and discussed.

Saturday, April 6, 2019, 10:30am to 10:45am

Polynomials, Their Algebra and Their Zeros. Students Learn to Construct Their Own Theorem.

Antonella Cupillari, Penn State University - The Behrend College

Session A - Zook 111

Abstract 19: In a discrete math/introduction to proof course we were examining some basic properties of the zeros of polynomials. Students were asked to make conjectures about the destiny of the zeros of polynomials when they are added, multiplied, divided. Then a student asked about exponentiation $P(x)^{Q(x)}$. Teasing each other about discovering an original theorem, students worked on solving a different polynomial exponential equation and wrote a theorem of their own. This experience gave them some insight on how mathematical results are generated.

Wolfram Technology in Education and Research

Andy M Dorsett, Wolfram Research

Session B - Zook 113

Abstract 20: This technical talk will show live calculations in Mathematica 11 and other Wolfram technologies relevant to courses and research. Specific topics include:

- Enter calculations in everyday English, or using the flexible Wolfram Language
- Store and share documents locally or in the Wolfram Cloud
- Use the Predictive Interface to get suggestions for the next useful calculation or function options
- Access trillions of bits of on-demand data
- Easily turn static examples into mouse-driven, dynamic applications
- Access 11,000 free course-ready applications
- Get deep support for specialized areas including machine learning, time series, image processing, parallelization, and control systems, with no add-ons required

Current users will benefit from seeing the many improvements and new features of Mathematica 11 (https://www.wolfram.com/mathematica/new-in-11/), but prior knowledge of Mathematica is not required.

Saturday, April 6, 2019, 10:30am to 10:45am

Modeling the Interactions between the Red Crabs and Yellow Crazy Ants on Christmas Island

Nick R Baumgartner*, Cleveland State University

Session C - Zook 113

Abstract 21: The current trend of the Red Crab population on Christmas Island is one of decline. The main cause of this is the growing number of Yellow Crazy Ants in their primary habitat. A model is introduced that captures the interactions between these two populations. Through analysis of this model, we illustrate how the number and location of "super ant colonies" greatly effects the rate at which the crab population can sustain itself.

Saturday, April 6, 2019, 10:50am to 11:05am

A Math Education Course on Gonzo Math and Factoradic

Zijian Diao, Ohio University - Eastern

Session A - Zook 111

Abstract 22: Non-decimal place value systems, such as binary systems, have been introduced and studied in many college-level courses in mathematics and computer science, but rarely is this subject at the front and center of a math education course. We propose an unconventional way of teaching such a course that immerses students in non-decimal thinking by focusing on the base-6 (Gonzo Math) and factorial number (factoradic) systems. This course is intended to serve as a continuation of the entry-level mathematical education course on basic arithmetic and number systems, while elevating these topics to a level just a notch below an undergraduate number theory course. Under our approach, we hope to instill in students a deeper understanding of various concepts in elementary mathematics such as place values, standard algorithms in arithmetic, divisibility tests, prime factorization, and irrationality.

Wolfram Technology in Education and Research

Andy M Dorsett, Wolfram Research

Session B - Zook 113

Abstract 23: This is a continuation of the preceding presentation.

Saturday, April 6, 2019, 10:50am to 11:05am

Gauze and Effect: A Mathematical Model of Wound Healing

Alec DeBoard*, Cleveland State University

Session C - Zook 113

Abstract 24: Wound healing is a complex process in response to an injury which attempts to restore anatomic structure and functionality of injured tissue. There are countless variables that influence this process, several of which are demonstrated in this model. By considering the roles of bacterial infections, inflammation, and tissue hypoxia in the process of wound healing, a mathematical model can be developed that effectively predicts wound healing. By manipulating the given variables in the model, values are tested to determine how healing is affected by a bandage covering the wound. This analysis can be compared to current common practices in wound healing and may help provide a more in-depth understanding of the process.

Saturday, April 6, 2019, 11:10am to 11:25am

The Online Punch: Experiences from Online Teaching

Irina Chernikova, The University of Akron

Session A - Zook 111

Abstract 25: The challenge of designing online courses is not only pedagogical, but also esthetic and psychological. A well-designed, user-friendly course needs to adhere to esthetic principles as well as pedagogical ones. This seems obvious – when designing an online course site, always ask "How will this look to the student"? Understandably many educators approach online course design with little expertise. And students' reaction and feedback follows. This presentation will analyze what we have learned from students' reaction and what changes we made to the course design as the result.

A Natural Use of a Trig Identity in Calculus

David Stuckey, Defiance College

Session B - Zook 113

Abstract 26: Sum-to-Product formulas appear in most trigonometry textbooks, but are rarely applied other than as exercises. As we develop the concepts of calculus, there is a natural way to use two of these formulas. We will use them to give an alternate way of proving two derivative formulas.

Saturday, April 6, 2019, 11:10am to 11:25am

The Firefly Phenomenon

Olivia Y Maslanka*, Cleveland State University

Session C - Zook 113

Abstract 27: At first glance, fireflies may seem to flash sporadically, disappearing only to reappear in a completely new location. A natural question arises: is this flashing actually random? Many have looked into this throughout the years, including G.B. Ermentrout and J. Rinzel. This presentation will summarize their work of how a firefly reacts to a single stimulus and then expand to include a spatial dependence where fireflies try to synchronize their lights with each other.

Saturday, April 6, 2019, 11:30am to 11:45am

Technically Efficient: Measuring the Efficiency of Ohio Universities in Teaching Mathematics

Sukanya Kemp, The University of Akron

Session A - Zook 111

Abstract 28: Success for higher education institutions is difficult to quantify given the numerous factors that affect efficiency of students, faculty and administration of said institutions. Ultimately, the goal is to explore various pathways to ensure student success. This presentation focuses on Ohio universities and uses Data Envelopment Analysis to see how the efficiency of these universities in graduating students of mathematics is measured.

Data Visualization with Python

Moez Ben-Azzouz, Sinclair Community College

Session B - Zook 113

Abstract 29: In this presentation, we will look at various types of graphs for visualizing data. We will then demonstrate how Python libraries and Jupyter notebooks can be used to explore, visualize, analyze, and summarize data. This talk does not require any prerequisite knowledge of these tools and is appropriate for anybody interested in data science and/or exploring the use of Python for data visualization.

Saturday, April 6, 2019, 11:30am to 11:45am

Semiprime Factorization with Numerical Approximation

Pengfei Jia*, Edinboro University of Pennsylvania

Session C - Zook 113

Abstract 30: After setting up semiprime into a function form with two unknown variables, a few approaches of polynomial interpolation (brute force, Newton, Lagrange, Linear Secant) will be applied to approximate the root(s) of prime function and the output will be compared in perspective of errors, speeds of operation and efficiency.

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