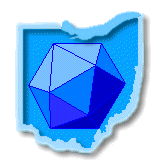
Program of Activities

For the 96th Annual Meeting of the

**Mathematical Association of America**

**Ohio Section**



Spring 2012

Xavier University

Cincinnati, Ohio

April 13-14, 2012

MAA Ohio Section

**Program**

***Friday, April 13***

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| **12:00 – 4:00** | Registration | CLC South Lobby |
| **12:00 – 1:20** | Student Team Competition | CLC 308/309 |
| **12:00-1:00** | Committee Meetings:  CONCUR (Fuller)  CONSACT (Hess)  CONTEAL (Prather)  Centennial Committee (Kullman) | CLC 215  CLC 214  CLC 417  CLC 423 |
| **12:00-4:00** | Book Vendors and Exhibits | CLC 413 |
| **1:30-1:45** | Welcome & Announcements | Kennedy |
| **1:45-2:45** | **Invited Address:**  **“Simple Surprises”**  ***Aparna Higgins, University of Dayton*** | Kennedy |
| **2:45-3:10** | Break | CLC South Lobby |
| **3:10-3:15** | Centennial Minute | Kennedy |
| **3:15-4:15** | **Invited Address: George Pớlya Lecture**  **“Packing space with regular tetrahedra”**  ***Jeffrey Lagarias, University of Michigan*** | Kennedy |
| **4:25 – 6:20** | **Contributed Paper Sessions** | SMH 249  SMH 250  SMH 251  SMH 252  SMH 346 |
| **4:25 – 6:20** | Executive Committee Meeting | McDonald 130 |
| **6:30- 8:00** | Student Pizza Party | Schiff Conference Rooms 1 & 2 |
| **6:30- 6:50** | Social Time | Schiff Banquet Ctr |
| **6:50-8:00** | Banquet | Schiff Banquet Ctr |
| **8:15-9:15** | Stage performance: **Calculus: The Musical!** | Schiff Banquet Ctr |
| **9:15** | Business Meeting and Presentation of the Teaching Award | Schiff Banquet Ctr |

***Saturday, April 14***

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| **8:00-10:00** | **Registration** | CLC South Lobby |
| **8:00-10:00** | **Book Vendors and Exhibits** | **CLC 413** |
| **8:00-8:50** | **Coffee and Pastries** | CLC South Lobby |
| **8:05-8:40** | **Meeting of Department Chairs’ and Liaisons** | CLC 308 |
| **8:05-8:40** | **Committee on Local Arrangements** | **CLC 309** |
| **8:50-9:00** | **Welcome and Announcements; Student Team Competition Results** | **Kennedy** |
| **9:00-10:00** | **Invited Address: “Submajorization and the Geometry of Unordered Collections, with Applications to Music and Welfare Economics”**  ***Rachel Hall, St. Joseph’s University*** | **Kennedy** |
| **10:00-10:20** | **Break** | CLC South Lobby |
| **10:25-11:40** | **Contributed Paper Sessions** | CLC 405  CLC 406  CLC 309 |
| **11:50-12:50** | **Retiring President’s Address: “Using mathematics to gain the upper hand at family game night”**  ***Jon Stadler, Capital University*** | **Kennedy** |
| **12:50** | **Closing Remarks** | **Kennedy** |

**Abstracts of Invited Addresses**

***Friday, April 13***

**Speaker:** Aparna Higgins

**Title:** *Simple Surprises*

**Abstract:** Once upon a time, in the Ohio Section of the MAA, two students who attended different schools and who did not know each other, presented talks at the Spring Meeting that were variations of the same problem. One spoke of the result of alternately inscribing regular polygons and circles, while the other spoke of the result of alternately circumscribing regular polygons and circles. Recently, I heard a talk on other variants of this theme, and I found myself still intrigued by the questions. I plan to take you on a meandering walk through some problems that delight me mathematically. The problems are simple to state, yet they have an element of surprise.

**Speaker: Jeffrey Lagarias**

**Title: *Packing space with regular tetrahedra***

**Abstract:** The problem of determining the densest packing of space by congruent regular tetrahedra has a long history, starting with Aristotle's assertion that regular tetrahedra fill space, and continuing through its appearance in Hilbert's 18th problem. This talk describes its history and many recent results obtained on this problem including contributions by physicists, chemists and materials scientists. The current record for packing density is held by my former student Elizabeth Chen, with Michael Engel and Sharon Glotzer.

***Saturday, April 14***

**Speaker: Rachel Hall**

**Title:** *Submajorization and the Geometry of Unordered Collections, with Applications to Music and Welfare Economics*

**Abstract:**  If several voices or musical instruments sound a sequence of chords, our ears track the movement in each voice. This association is called voice leading. Although composers are normally instructed to “minimize” the overall amount of vocal movement, there is no principled way of choosing a measure for vocal movement when multiple individuals are involved. A similar problem arises in welfare economics: if we wish to measure income volatility, we must measure multiple income changes simultaneously. Tymoczko (2006) proposed requirements that every method of comparing voice leadings should satisfy. We show that these requirements are equivalent to the submajorization partial ordering, defined by Hardy, Littlewood, and Polya (1934) and developed in the study of welfare economics. We further show how to use submajorization to compare distances in the orbifolds (quotients of ) representing the geometrical space of “chord types.” (This represents joint work with Dmitri Tymoczko, Princeton University.)

**Speaker:** Jonathan Stadler

**Title:** *Using mathematics to gain the upper hand at family game night*

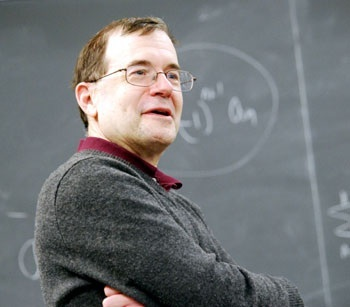
**Abstract:** Games are an excellent way for children to develop reasoning, a sense of likelihood and chance, and mathematical skills such as counting and elementary arithmetic. In the meantime, kids enjoy the prospect of winning, the pleasure of problem solving, and the company of their fellow gamers. Although mathematicians are apt to enjoy games for these reasons as well, we cannot resist using mathematics to analyze these games, sometimes learning better playing strategies (sharing these strategies with our mini counterparts, of course!). We will discuss mathematics related to Duck Duck Bruce and Left Center Right. In particular, we will study the best card-stealing strategy in Duck Duck Bruce, and the likelihood of winning as a function of whether you go, first, second, or even last in Left Center Right. Probability, discrete mathematics, and linear algebra are some of the familiar undergraduate topics that will be used to investigate these games.

**Brief Biographies of Invited Speakers**

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**Aparna Higgins, University of Dayton**

Aparna Higgins received a B.Sc. in mathematics from the University of Bombay in 1978 and a Ph.D. in mathematics from the University of Notre Dame in 1983. Her dissertation was in universal algebra, and her current research interests are in graph theory. She has taught at the University of Dayton, Ohio, since 1984. Although Aparna enjoys teaching the usual collection of undergraduate courses, her most fulfilling experiences as a teacher have come from directing undergraduates in mathematical research. She has advised twelve undergraduate Honors theses; she has co-directed an NSF-sponsored Research Experiences for Undergraduates program; and she continues to help students prepare talks for regional and national mathematics meetings. Aparna is an advocate of academic year undergraduate research at one’s own institution. She has presented workshops (often with Joe Gallian) at mathematics meetings on directing undergraduate research. She enjoys giving talks on mathematics to audiences of various levels and backgrounds. Aparna has been the recipient of four teaching awards -- from the College of Arts and Sciences at the University of Dayton, the Alumni Award (a University-wide award) at the University of Dayton, the Ohio Section of the Mathematical Association of America, and in 2005, the Deborah and Tepper Haimo Award for Distinguished College or University Teaching, which is the Mathematical Association of America's most prestigious award for teaching. Aparna has served the MAA in many capacities, including being a founding member of, and then chairing, the Committee on Student Chapters, which helped create and maintain Student Chapters, provided support to Sections for student activities and provided appropriate programming for undergraduates at national meetings. Aparna is Director of Project NExT (New Experiences in Teaching), a professional development program of the MAA for new or recent Ph.D.s in the mathematical sciences. Aparna has served as President of the Ohio Section, and on several committees of the Ohio Section. Aparna Higgins is married to Bill Higgins, a mathematician who teaches at Wittenberg University, in Springfield, Ohio. They like to take year-long sabbaticals and spend part of that time teaching at other institutions. They feel privileged to have taught at the Naval Postgraduate School in Monterey, California, at the United States Military Academy in West Point, New York, and at California State University Channel Islands. Aparna and Bill Higgins have two sons.

**Jeffrey Lagarias, University of Michigan**

Jeff Lagarias is a Professor of Mathematics at the University of Michigan. His research interests include number theory, discrete and computational geometry, cryptography, dynamical systems, optimization and more. He was a Putnam exam winner at MIT in 1970, and received his PhD from MIT in 1974 in analytic number theory. He then worked at Bell Laboratories and its descendants on a wide variety of pure and applied mathematical topics. At various times he held visiting positions in mathematics, computer science and physics. In 2004 he moved to the University of Michigan. He has received a Lester R. Ford prize twice, and was the 2005 Raymond Hedrick Lecturer at MathFest. He recently edited a book on the 3x+1 problem (“The Ultimate Challenge") and another on the Hales-Ferguson solution of the Kepler Conjecture on sphere packing.

**Rachel Hall, St. Joseph’s University**

Rachel Wells Hall is an associate professor of mathematics at Saint Joseph's University, where she researches and teaches both mathematics and music. She is writing a book entitled The Sound of Numbers: A Tour of Mathematical Music Theory. She has toured the Mid-Atlantic States since 1995 with the folk trio Simple Gifts and recorded three albums. She plays English concertina, piano, and fiddle.  Rachel is originally from Cincinnati, where she attended Walnut Hills High School.

**Jonathan Stadler, Capital University**

Jon Stadler’s first exposure to the Ohio Section was in 1991, when the annual meeting was held at Bowling Green State University. At this conference, he presented on the Cantor Set. After graduating from BGSU in 1992, Jon attended The Ohio State University, earning his PhD in 1997 in algebraic combinatorics. After a year of teaching at Coastal Carolina University, he returned to Ohio to begin his current position at Capital University. Jon has served in the Ohio Section on CONCUR, as the local arrangements chair for the 2003 summer short course on cryptology, and on the program committee, serving as chair from 2008-2009. His research interests are in recreational mathematics, particularly puzzles, games, and most of all, juggling.



### Matheatre was created in 2006 when Marc Gutman and Sadie Bowman decided to write a show so they could quit their jobs and have a cross-country adventure. The result was *Calculus: The Musical!* which they toured for two years. Though Marc and Sadie are happy to be off the road, the tour continues under the supervision of Know Theatre of Cincinnati. Marc and Sadie are currently working on a number of projects, including new shows, new albums, and new culinary inventions.

**Contributed Paper Sessions**

*Friday, April 13* **\*= student speaker**

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| --- | --- | --- | --- | --- | --- |
| **Time** | **SMH 249**  **Session Chair:**  **Adam Parker** | **SMH 250**  **Session Chair:**  **Minnie Catral** | **SMH 251**  **Session Chair:**  **Ganesh Malla** | **SMH 252**  **Session Chair:**  **Max Buot** | **SMH 346**  **Session Chair: Hem Joshi** |
| 4:25-4:40 | **Anna Payne \***  **Ashland University**  "Let's Make a Deal": Probabilities of a Popular Game Show | **David E Kullman**  **Miami University – Oxford**  Two Pioneer Mathematicians in 19th-Century Cincinnati | **Jay L Schiffman**  **Rowan University**  Primes Less Than One Thousand That Never Enter the Lucas Sequence. | **Joseph P Glaser\***  **Cleveland State University**  Exploring Metrics and Working with Tensors | **Zbigniew Piotrowski**  **Youngstown State University**  On Volterra property of all real-valued functions of real variable |
| 4:45-5:00 | **Bradley J Sekas\***  **Ashland University**  Can Counting Cards Win You Money? | **Tom Hern**  **Bowling Green State University - Main**  Old Woodward and E. H.Moore | **Jason D Cooke\***  **Youngstown State University**  Keeping Your Private Text Messages PRIVATE! | **Michael T Hardin\***  **Cleveland State University**  Mathematical Physics and Scattering Theory | **Hem Joshi**  **Xavier University**  The Influence of Education in Reducing the HIV Epidemic |
| 5:05-5:20 | **Larissa Berry\***  **Ashland University**  The Last Stone Standing: The Winning Strategy of Nim | **Phil Blau**  **Shawnee State University**  Hilbert's Basis Theorem | **Daniel P Catello\***  **Youngstown State University**  Exploring a Binary Operation | **Timothy G Clos\***  **Cleveland State University**  The Riemann Mapping Theorem | **Gokul R Kadel**  **Bowling Green State University – Main**  Chaotic Extensions of Operators on Hilbert Subspaces |
| 5:25-5:40 | **Caitlin M Music\***  **Ashland University**  Stop or Go | **Thomas Dence**  **Ashland University**  Multiple Methods of Evaluating an Improper Integral | **Sarah E Ritchey\***  **Youngstown State University**  Points with Integer Distances | **Sean P Sheridan\***  **Cleveland State University**  Projective Modules in Homological Algebra | **Leonardo V Pinheiro**  **Bowling Green State University – Main**  Sliding ladders, Special Relativity, and Reality |
| 5:45-6:00 | **John Bentley\***  **Ashland University**  The Prime Detective | **Curtis A Grosse**  **Saginaw Valley** State University  How an Actuary Models Financial Risk in Equity Markets | **MB Rao**  **University of Cincinnati**  Extensions of a Number Trick of Martin Gardner | **Mario Sracic\***  **Youngstown State University**  Finding Aut(G), Inn(G), and Out(G) | **Kelly M. Bubp**  **Ohio University – Athens**  Students' Intuitions on a Monotonicity Task |
| 6:05-6:20 | **Christopher N Swanson**  **Ashland University**  Maximizing Sum of Three-Digits Numbers |  |  | **Robert Short\***  **John Carroll University**  Trading Vertices for Edges | **Weiping Li**  **Walsh University**  A Generalization of Leibniz's Test |

**Contributed Paper Sessions**

***Saturday, April 14* \*= student speaker**

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| **Time** | **CLC 405**  **Session Chair:**  **David Singer** | **CLC 406**  **Session Chair:**  **Richard Pulskamp** | **CLC 309**  **Session Chair:**  **Adam Parker** |
| 10:25-10:40 | **Mike T Homsher\***  **The University of Findlay**  Attack on Lake Erie: Invasion of the Carp? | **Richard Pulskamp**  **Xavier University**  A Mechanical Device for Least Squares Problems | **Matthew Menzel**  **Marietta College**  Engaging Students with WeBWork |
| 10:45-11:00 | **Ryan 'Dex' Spath\***  **The University of Findlay**  Cellular Automaton: Real World Complexity from Simple Origins | **Justin Young**  **Ashland University**  Zooming in on Chinese Mathematics | **Giorgi Shonia**  **Ohio University – Lancaster**  Online Math Problem Banks |
| 11:05-11:20 | **Anne Albert\***  **The University of Findlay**  Prerequisite Knowledge and Student Learning | **Trang T Ha\***  **Wittenberg University**  The Prime Number Theorem and the Riemann Hypothesis | **Katie Cerrone**  **The University of Akron**  Expanding the Classroom with Tablet Technology |
| 11:25-11:40 | **L ogan J Opperman\***  **The University of Findlay**  Typical Student + Fewer Meetings a Week = Less Success?: A Statistical Analysis | **Caitlin M Zook\***  **Ohio Northern University**  My Relentless Struggle with a Sangaku Problem | **David A Cusick**  **Marshall University**  Just How Does My Calculator Do That, Anyway? |

**Abstracts of Contributed Papers**

**Friday 4:25 – 4:40 PM**

**"Let's Make a Deal": Probabilities of a Popular Game Show**

Anna Payne\*

Ashland University

Abstract 1: The well-known Monty Hall Problem asks, "Will I have a better chance of winning the car if I switch doors?" In this talk we will discuss the probabilities for the traditional problem. We will also explore strategies for improving our chance to win a generalized Monty Hall problem that has n doors and one car.

**Two Pioneer Mathematicians in 19th-Century Cincinnati**

David E Kullman

Miami University – Oxford

Abstract 2: Joseph Ray and Thomas Matthews were affiliated with Woodward High School in Cincinnati during the 1830's and 1840's. Ray is best known for his series of Arithmetic and Algebra textbooks, and Matthews was also a professor of mathematics at Miami University. Their influence on secondary and collegiate mathematics can still be felt today.

**“Primes < 1000 That Never Enter the Lucas Sequence”**

Jay L. Schiffman

Rowan University, Glassboro, NJ

Abstract 3: It is well known that among the initial Fibonacci numbers, at least one is divisible by n. The Lucas sequence L[n] defined by L[1] = 1, L[2] = 3, and

L[n] = L[n-2] + L[n-1] for possesses primes that never enter the sequence as factors. Using modular arithmetic, we identify these primes and also discuss periodicity and divisibility ideas in the sequence.

**Exploring Metrics and Working with Tensors**

Joseph P Glaser\*

Cleveland State University

Abstract 4: A continuation of my talk last spring, I will be focusing on the applications of tensor analysis, specifically its usefulness in displaying and working with metrics. This educational talk is geared towards students/professors interested in basic differential geometry and taking a look at some of its applications. We will look at several simple geometries and work through examples that relate directly to applications in the Theory of General Relativity.

**On Volterra Property of All Real-valued Functions of Real Variable**

Zbigniew Piotrowski

Youngstown State University

Abstract 5: After learning that there is the "small Riemann" function (also known as Thomae function) f : R -> R that is continuous at every irrational number and discontinuous at every rational, a curious student can ask: How about the other way around? That is, does there exist a function f: R -> R that is continuous exactly on rationals and discontinuous at irrationals? A proof that such a function does not exist will be given. By the end of the talk we shall introduce Volterra spaces.

**Friday 4:45 – 5:00 PM**

**Can Counting Cards Win You Money?**

Bradley J Sekas\*

Ashland University

Abstract 6: From movies we get the impression that counting cards in casino blackjack will guarantee you winning thousands of dollars. This talk will take a closer look at blackjack, demonstrating probabilities as the game progresses and the deck of cards changes. We will also look at common counting schemes and attempt to answer the question: "Will you really win thousands or lose more than you bargained?"

**Old Woodward and E. H.Moore**

Tom Hern

Bowling Green State University - Main

Abstract 7: E. H. Moore, one of the main players in the beginnings of American research mathematics, was a student at Old Woodward High School in Cincinnati.  He was introduced to mathematics by Ormond Stone of the Cincinnati Observatory on Mt. Adams.  I have a personal connection.

**SMS Crypto Using Diffie-Hellman Key Exchange and AES Over a Wireless Network**

Jason D Cooke\*

Youngstown State University

Abstract 8: The subject is the use of the Diffie-Hellman key exchange over a wireless network via SMS and the subsequent generation of AES keys for text message encryption/decryption between two parties. Focus will be given to mathematical explanations of both the Diffie-Hellman exchange and the security issues involved in its use. Also covered will be an in-depth look at the algorithm used in the key exchange and some of the challenges in its implementation on a mobile platform. A working demonstration will also be given, time permitting.

B**ridging the Gap Between Classical and Quantum Mechanics via Scattering Theory**

Michael T Hardin\*

Cleveland State University

Abstract 9: Scattering theory is the study of the behavior of projectiles being launched at a target. Ample analysis of scattering theory in the closely related fields of classical and quantum mechanics exists and continues to thrive. It is my objective to show how quantum mechanics blends itself into classical mechanics through scattering theory. In particular, I will compute the scattering amplitudes in the case of specular reflection in hard and soft sphere scattering. I will present the derivation of a mathematically significant approximation that will ultimately lead to an equation describing quantum mechanical scattering that is equal to its classical counterpart.

**The Influence of Education in Reducing the HIV Epidemic**

Hem Joshi

Xavier University

Abstract 10: Increasing awareness through education is one of the tools used to decrease the spread of HIV. Uganda's government started the ABC campaign, which promotes Abstinence, Be Faithful, and Condoms to reduce the HIV infection. The HIV/AIDS infection rates have decreased significantly due to organizations promoting this campaign and other educational information. A SIRE model will be used to evaluate the effectiveness of these organizations on the HIV epidemic.  The model is a system of ordinary differential equations in which data from Uganda about the epidemic and educational influences will be used to help estimate the parameters of infection rates.

­­­­­­­­­­­­**Friday 5:05 – 5:20 PM**

**The Last Stone Standing: The Winning Strategy of Nim**

Larissa Berry\*

Ashland University

Abstract 11: Nim is a simple yet challenging game. We will demonstrate a winning strategy for the traditional game, as well as consider generalized games that also have a winning strategy.

**Hilbert's Basis Theorem: Mathematics or Theology**

Phil Blau

Shawnee State University

Abstract 12: Upon examining the the proof of Hilbert's Basis Theorem, Paul Gordan, a leading mathematician in the field of invariant theory, remarked: This is not Mathematics, it is Theology! This talk will discuss Hilbert's Basis Theorem, in particular his 1890 paper in the Mathematische Annalen, and the application of the theorem to find a finite complete system of invariants for forms. We will also examine the reactions of some mathematicians to the quote.

**Exploring a Binary Operation**

Daniel P Catello\*

Youngstown State University

Abstract 13: The real numbers are considered under a new operation. Identity, inverses, commutability, and associability are shown with an abstract algebra approach. Investigation into generalizing this operation for the xn case is shown by induction. The operation is “patched up”, making the set and operator a group for all real numbers.

**The Riemann Mapping Theorem**

Timothy G Clos\*

Cleveland State University

Abstract 14: Simply connected open regions other than the complex plane itself have the property that they are conformally equivalent to the open unit disk centered at the origin. This is the main crux of the Riemann mapping theorem. We will first briefly outline introductory material necessary for the proof, including conformal equivalence, complex differentiation, analytic square roots, and Montel's theorem. Then, a detailed explanation of the proof of the Riemann mapping theorem will follow. The proof will examine the existence of an analytic map, its injectivity, and its surjectivity. If time permits we will examine an application to a proof of the Isoperimetric inequality.

**Chaotic Extensions of Operators on Hilbert Subspaces**

Gokul R Kadel

Bowling Green State University – Main

Abstract 15: We present some of the results concerning the extension of bounded linear operators on a Hilbert subspace: If M is a closed subspace of a separable, infinite dimensional Hilbert space H with dim (H/M) = infinity, then every bounded linear operator A: M to M can be extended to a chaotic operator T: H to H that satisfies the hypercyclicity criterion in the strongest possible sense.

­­­­­­­­­­­­**Friday 5:25 – 5:40 PM**

**Stop or Go**

Caitlin M Music\*

Ashland University

Abstract 16: In this talk we will imitate the "Showcase Showdown" by having each contestant pick one or two random numbers in [0, 1] to get a sum as close to 1 without going over. Using both simulation and probability calculations, we look at the optimal threshold for deciding whether to pick a second number or not, to have the best chance of beating an opponent. We also consider variations on this game.

**Multiple Methods of Evaluating an Improper Integral**

Thomas Dence

Ashland University

Abstract 17: In standard Calculus students are introduced to the integral of 1/(1+x2) with limits 0 and infinity. In this talk I look at the related integral of 1/(1+x4) with limits 0 and infinity, and present four different methods of evaluation.

**Finding Points on a Circle with Integer Distances with Respect to an Equilateral Triangle**

Sarah E Ritchey\*

Youngstown State University

Abstract 18: Let the equilateral triangle ABC with integer side c be inscribed in a circle. A solution is provided to the Pi Mu Epsilon Journal problem #1245 proposed by Stan Rabinowitz, as to whether there exists a point on the curve with two distinct integer distances from the two closest vertices of the triangle.

**Projective Modules in Homological Algebra**

Sean P Sheridan\*

Cleveland State University

Abstract 19: Homological Algebra is a branch of mathematics that studies the structure of rings and modules. A ring is a structure in which we can add, subtract, and multiply, but not necessarily divide. For example, the set of integers, Z, is a ring, as is any field. The notion of module generalizes that of vector space: the scalars come from a fixed ring, rather than from a field. An example of a module that is not a vector space is Zn, which is a module over the integers, Z. A functor is a rule that transforms modules into different modules, and linear maps between modules into different linear maps. Exactness is a property that a functor can have that makes computations in homological algebra easy. Let R be a ring, and let M be an R-module. This project shows that the functor which maps an R-module N to the tensor product of N and M is exact if and only if M is a so-called projective module.

**Sliding Ladders, Special Relativity, and How Reality Always Gets in the Way.**

Leonardo V Pinheiro

Bowling Green State University – Main

Abstract 20: Teaching Calculus often involves convincing our students of the importance of mathematical modeling as the ultimate tool in the hard sciences. In this talk we will revisit a classic problem for which the first-year Calculus approach leads to bizarre consequences.

­­­­­­­­­­­­**Friday 5:45 – 6:00 PM**

**The Prime Detective**

John Bentley\*

Ashland University

Abstract 21: The primeness of numbers is straightforward to determine but time consuming in practice. By leveraging alternate methods such as Fermat's Theorem and Euler's Criterion, one can determine primality much more efficiently than simply checking divisibility. We will compare the methods, look at some disadvantages, and consider workarounds for them.

**How an Actuary Models Financial Risk in Equity Markets**

Curtis Grosse

Saginaw Valley State University

Abstract 22: The credit crisis of 2007-08 led many in the financial service industry to question standard models for risk assessment. These include CAPM, Value at Risk, hedging instruments, etc. Actuaries model risk conservatively by nature and can help provide a mathematical and statistical basis for augmented models that would have worked much better during the credit crisis. I find that much of what we used for risk management within our company can also be applied practically in the individual financial portfolios of you and me.

**Extensions of a Number Trick of Martin Gardner**

MB Rao

University of Cincinnati

Abstract 23: A classical number trick propagated by Martin Gardner runs as follows. 1. Choose a number between 1 and 31. 2. I will guess what the chosen number was. 3. Here are 5 strips of paper on which some numbers from 1 to 31 are printed. 4. Just point out which of these strips contain your chosen number. 5. Now I know what your chosen number was. Variations and extensions of this trick will be presented in this talk.

**Finding Aut(G), Inn(G), and Out(G) for Various Groups G**

Mario Sracic\*

Youngstown State University

Abstract 24: If G is a group and φ maps G to G such that φ is one-to-one, onto, and a homomorphism, we call φ an automorphism. Then φ belongs to the group of automorphisms of G, or Aut(G). Once defining the groups Aut(G), Inn(G), and Out(G), we will examine some of their relationships. Then we will look at the group Sn, with particular interest on n = 6, in order to find Out(S6).

**Students' Intuitive Thoughts on a Prove-or-Disprove Monotonicity Task**

Kelly M. Bubp

Ohio University – Athens

Abstract 25: In this interactive presentation, audience members will be asked to complete a prove-or-disprove task involving monotonic functions and consider how their students might think intuitively about the task. Results from exploratory research on undergraduate students' intuitive thoughts on the task will be presented. The effectiveness of these intuitions in supporting valid mathematical thinking on the task will be discussed.

­­­­­­­­­­­­**Friday 6:05 – 6:20 PM**

**Maximizing the Sum of Three-Digit Numbers Consisting of the Digits 1 through 9**

Christopher N Swanson

Ashland University

Abstract 26: Consider a game in which 9 cards with each of the digits 1 through 9 are placed face down on a table. A player randomly draws one of these cards and decides to place the digit in the ones, tens or hundreds place of a 3-digit number. The player then draws a 2nd distinct card and the digit has to be placed in one of the remaining two places of the 3-digit number and then draws a 3rd distinct card to place the final digit, completing the 3-digit number. The player continues to draw distinct cards until three 3-digit numbers are created from the 9 distinct digits. These 3-digit numbers are added together and the player’s goal is to create as large of a sum as possible. In this talk, I will present the analysis of various strategies including the optimal strategy to maximize the sum.

**Trading Vertices for Edges: A Reversible View of Graphs**

Robert Short\*

John Carroll University

Abstract 27: In graph theory, we often view graphs as a set of vertices along with a set of pairs of vertices, which we then call edges. Taking an alternate view, where vertices and edges are distinct sets, has nice topological consequences. In addition, it allows us to reverse the roles of the vertex and edge sets, forming what we call the reversal of the graph. When this gives us a graph, we call the graph reversible, and when the reversal of a graph is isomorphic to the original, we call the graph a self-reversible graph. In this talk, we will explore the collection of reversible graphs and classify the collection of self-reversible graphs.

**A Generalization of Leibniz's Test**

Weiping Li

Walsh University

Abstract 28: In this talk, we will be looking at a generalization of Leibniz's test for convergence of alternating series and use it to determine the convergence of some general series.

­­­­­­­­­­­­**Saturday 10:25 – 10:40 AM**

**Attack on Lake Erie: Invasion of the Carp?**

Mike T Homsher\*

The University of Findlay

Abstract 29: Eugene Braig, IV identified Lake Erie as being the most habitable environment for Asian Carp in the Great Lakes. Given the frequency with which the electric fences near the Chicago seaway go down, and the ability of the Carp to bypass them by jumping, is it probable that two Carp could make their way through Lake Michigan, Lake Huron, Lake Erie and then find the Maumee River and thus start a colony of reproducing Asian Carp? If so, then we could lend credibility to those who wish to close the seaway and could help provide evidence that could be used to protect the Great Lakes Fisheries. Our program attempts to answer this question utilizing random variable generators, combined with their lifespan and speed with which they swim.

**Viktor Buniakovsky's Mechanical Device to Assist in the Solution of Least Squares**

Richard Pulskamp

Xavier University

Abstract 30: The Russian mathematician Viktor Buniakovsky designed what he called a summing square for the purpose of easing the labor required to solve least squares problems. He read a report of his testing of a model before the St. Petersbourg Academy in 1858. We describe the construction of the instrument, how he exploited the Pythagorean Theorem, and his error analysis.

**Engaging Students with WeBWork**

Matthew Menzel

Marietta College

Abstract 31: For mathematics courses, it is invaluable for students to be introduced to material before they encounter it in class. The challenge for instructors is to find creative ways to "encourage" this self-introduction. During the past year, I have begun using WeBWorK (an open source Perl-based system for delivering individualized homework problems over the web) to assign Calculus problems that students must complete before a section is covered in class. In this talk, I will discuss how I have implemented this, how students have received it, and the successes and challenges that I have encountered with using an online homework system in this manner.

­­­­­­­­­­­­**Saturday 10:45 – 11:00 AM**

**Cellular Automaton: Real World Complexity from Simple Origins**

Ryan ‘Dex’ Spath\*

The University of Findlay

Abstract 32: This presentation deals with the role of cellular automaton in current research in mathematics, computer science, and essential mechanisms of nature. Technology currently has complicated structure to accomplish relatively simple tasks. Cellular automaton challenges the status quo that complex systems must have complex origins. We will show that cellular automaton can realize complex behavior from very simple rules.

**Zooming in on Chinese Mathematics: The Ruffini-Horner Method**

Justin Young

Ashland University

Abstract 33: Many students in algebra, precalculus, and calculus courses today use graphing calculators extensively, especially when approximating zeros to functions. But the idea of zooming in toward a zero actually has its roots in eleventh century Chinese mathematics, and it came into its most polished form in the work of Qin Jiushao in 1247. The algorithm, later re-discovered in Europe in the early 19th century, is known today as the Ruffini-Horner method. We will discuss this algorithm, a bit of its history, the connection to zooming in on a graph, and some examples as time allows.

**Online Math Problem Banks at Ohio University Lancaster**

Giorgi Shonia

Ohio University - Lancaster

Abstract 34: Online math problem banks at Ohio University, Lancaster is a two platform project. We develop problem banks under Blackboard interface and explore WebWork alternative for courses which need visually rich graphing capabilities and can benefit for National problem banks. Project aims at accumulating experience, developing problem bank standards and fostering exchange of actual problems and best practices among faculty. Serving as a free alternative to increasingly costly proprietary platforms (Webassign, MyMathLab) is also of consideration. Project is scheduled to develop over next two years. We are currently soliciting funds and looking for partners.

**Saturday 11:05 - 11:20 AM**

**Role of Prerequisite Knowledge in Student Learning in Lower Level Mathematics Courses**

Anne Albert

The University of Findlay

Abstract 35: The mathematics department at the University of Findlay is investigating ways to improve student success in lower level mathematics classes. A fall 2011 study was completed on the algebra preparedness of the students in four mathematics courses, Intermediate Mathematics, Elementary Statistics, Precalculus, and Applied Mathematical Analysis. Their previous mathematics courses were reviewed, a brief algebra pretest was given at the beginning of the four courses, and exam grades in the course were analyzed. The study involved 25 classes. The algebra pretest and exam data was paired by student. The variability of the student’s exam score was reviewed based on their algebra prerequisite. A separate analysis was done for each section of each course. The results of this first semester of the study will be presented along with plans for the future.

**The Prime Number Theorem and Its Connection with the Riemann Hypothesis**

Trang T Ha\*

Wittenberg University

Abstract 36: This talk will focus on the Prime Number Theorem and its connection with the Riemann Hypothesis. The Prime Number Theorem states that π(x) ~ Li (x), where π(x) is the number of primes that are less than or equal to x and Li (x) =. The Riemann Hypothesis provides a good bound for the error and yields an explicit formula for π(x) instead of the asymptotic formula. This formula relies on the location of the roots of the Zeta function: ζ(s) = where n runs from 1 to. In his paper on number theory, Riemann proposed that all non-trivial zeros of the zeta function on complex plane lie on the line s = 1/2, which is known as the critical line. The well-known hypothesis still remains unsolved.

**Expanding the Classroom with Tablet Technology**

Katie Cerrone

The University of Akron

Abstract 37: Tablet technology provides an opportunity for instructors to enhance lessons and offer additional resources for their students. My presentation will explain how I use course note packets, online resources and tablet technology to keep my students engaged during class. I will also discuss how I use screen capture software to make course material available to students for review on their own time.

­­­­­­­­­­­­**Saturday 11:25 – 11:40 AM**

**Typical Student + Fewer Meetings a Week = Less Success?: A Statistical Analysis**

Logan J Opperman\*

The University of Findlay

Abstract 38: Data gathered from four past semesters of MTH 123: Introduction to Statistics will be analyzed to answer the following questions: Do students who struggle with mathematics tend to sign up for two-day a week classes? Do students tend to be more successful when they meet three days a week? How do student success rates compare between two-day a week courses, three-day a week courses and online courses?

**My Relentless Struggle with a Sangaku Problem**

Caitlin M Zook\*

Ohio Northern University

Abstract: Sangaku are wooden tablets on which geometric problems were written beginning in the 17th century in Japan. These tablets were considered works of art and religious offerings. We will explore a particular sangaku problem: Given three pairwise tangent circles and their radii, can we find the fourth circle that is tangent to the other three and find its radius? Before we look at this problem, I will present some background on sangaku problems and their connection to related problems. Then, I will analyze the problem algebraically to derive the formula for the radius of the fourth circle from Descartes Circle Theorem. A derivation of the radius formula independent of Descartes Theorem will follow. Finally, I will provide some basic compass and straightedge constructions which I will use to geometrically solve the given problem.

**Just How Does My Calculator Do That, Anyway?**

David A Cusick

Marshall University

Abstract: It might be a decibel, an earthquake magnitude or an integral. For whatever reason, you need a decimal value for a logarithm. So you reach for your calculator; and after a few moments of button pressing, that decimal value is in your possession. Just what happens inside that calculator? This talk will answer that question for you, and it should be entirely easy to follow.

**Acknowledgements**

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**Announcement Fall 2012 Section Meeting**

The Ohio Section of the Mathematical Association of America will hold its annual Fall meeting on **October 19-20, 2012**, at Baldwin-Wallace College. The invited speakers for that meeting are Erica Flapan of Pomona College, David Meel of Bowling Green State University, Matthew Neal of Denison University, and Thomas Ratliff of Wheaton College. More details, including submission information for contributed talks from faculty and students, will be forthcoming in the Fall edition of the Ohio Section newsletter and also on the Ohio Section web site, [**www.maa.org/ohio**](http://www.maa.org/ohio)**.**