Program of Activities
For the Fall Meeting of the

Mathematical Association of America

Ohio Section

Fall 2008
Capital University
Columbus, Ohio
October 24-25, 2008

MAA Ohio Section

Program

Friday, October 24, 2008

11:30-12:00	Nominating Committee	Harry Moores Campus Center Weiler Conference Suites
12:00-4:30	Registration	Ruff Learning Center lobby
12:00-1:00	Committee Meetings:	Harry Moores Campus Center
	CONCUR	Meeting Room 1
	CONSACT	Meeting Room 2
	CONSTUM	Schneider Lounge
	CONTEAL	Schuh Conference Room
	Centennial Committee	Weiler Conference Suites
1:00-4:30	Vendor and Book Exhibits	Kerns, Stegemoeller Lounge
1:15-1:30	Welcome & Announcements	Kerns, Kable Chapel
1:30-2:30	**Invited Address:** **"**Answering one of Calculus' Most Boring Questions. (Math with Cosmo)" John Tynan Marietta College	Kerns, Kable Chapel
2:30-3:00	Break	Kerns, Kable Chapel Lobby
3:00-4:00	**Invited Address:** "Linguistic Issues in College Mathematics Courses" Susanna Epp DePaul University	Kerns, Kable Chapel
4:10-6:05	**Contributed Paper Sessions**	Troutman Hall, rooms 112, 114
4:10-6:05	Executive Committee meeting	Harry Moores Campus Center Schuh Conference Room
6:05-6:30	**Social time**	Harry Moores Campus Center Weiler Conference Suites
6:30-7:45	**Banquet**	Harry Moores Campus Center Weiler Conference Suites
7:55-8:35	**After-Dinner Talk:** "Proofs and Confirmations: The Story of the Alternating Sign Matrix Conjecture" David Bressoud Macalester College	Harry Moores Campus Center Weiler Conference Suites

Saturday, October 25,2008

8:00-10:15	Registration	Troutman Hall Lounge
8:00-10:15	Vendor and Book Exhibitions	Troutman Hall Lounge
8:00-8:50	Coffee and donuts	Troutman Hall Lounge
8:05-8:40	Executive Committee meeting continuation (if necessary)	Harry Moores Campus Center Schuh Conference Room
8:50-8:55	Announcements	Ruff Learning Center Bridge
8:55-9:55	**Invited Address:** "On the difficulty of faking data" Wiebke Diestelkamp University of Dayton	Ruff Learning Center Bridge
9:55-10:15	Break	Troutman Hall Lounge
10:25-11:40	**Contributed Paper Sessions**	Ruff Learning Center, Troutman Hall
11:50-12:50	**Invited Address:** David Bressoud Macalester College	Ruff Learning Center Bridge

Abstracts of Invited Addresses

Friday

Speaker: John Tynan
Title: *Answering one of Calculus' Most Boring Questions. (Math with Cosmo)*
Abstract: We have all asked our students to determine the maximum area that can be enclosed using a fixed amount of fence and perhaps a barn, or a river (everyone knows cattle cannot go in the water), or the not quite as nice cliff (that the cattle do not want to fall off of). Countless times we have given full credit for the nice square answer and maybe even a rectangle twice as long as it is wide with the above mentioned barn as one side. But have we really thought about this question? Fortunately, the good people at Kramerica Incorporated have not only thought about this question, they have asked for help from Calculus students from all over the world (or at least the tri-state area). Their answers may surprise you and will hopefully allow you to see this boring question in a new light.

Speaker: Susanna S. Epp
Title: *Linguistic Issues in College Mathematics Courses*
Abstract: Much of what we say and write in our mathematics classes assumes that our students understand linguistic and logical conventions that have never been made explicit to them. What problems result from this assumption, and how can we address them?

Speaker: David Bressoud
Title: *Proofs and Confirmations: The Story of the Alternating Sign Matrix Conjecture*
Abstract: What is the role of proof in mathematics? Most of the time, the search for proof is less about establishing truth than it is about exploring unknown territory. In finding a route from what is known to the result one believes is out there, the mathematician often encounters unexpected insights into seemingly unrelated problems. I will illustrate this point with an example of recent research into a generalization of the permutation matrix known as the "alternating sign matrix." This is a story that began with Charles Dodgson (aka Lewis Carroll), matured at the Institute for Defense Analysis, drew in researchers from combinatorics, analysis, and algebra, and ultimately was solved with insights from statistical mechanics.

Saturday

Speaker: Wiebke Diestelkamp
Title: *On the difficulty of faking data*
Abstract: Most people have preconceived notions of randomness that often differ from true randomness. We will discuss examples that seem to contradict our intuition, as well as methods that can help to distinguish random from fake data. In particular, we will investigate the distribution of digits in certain data sets and show how it can be used to detect fraud.

Speaker: David Bressoud
Title: *Calculus as a High School Course*
Abstract: Abstract: Over the past quarter century, 2- and 4-year college enrollment in first semester calculus has remained constant while high school enrollment in calculus has grown tenfold, from 50,000 to 500,000, and continues to grow at 6% per year. We have reached the cross-over point where each year more students study first semester calculus in US high schools than in all 2- and 4-year colleges and universities in the United States. There is considerable overlap between these populations. Most high school students do not earn college credit for the calculus they study. This talk will present some of the data that we have about this phenomenon and its effects and will raise issues of how colleges and universities should respond.

Brief Biographies of Invited Speakers

John Tynan, Marietta college

John Tynan received his B.A. from Grove City College and his M.S. and Ph.D. from Ohio University in 1998 and 2002. He then stumbled into a position at Marietta College where he has been ever since. A matrix theorist specializing in generalized inverses of non-negative matrices by trade, Tynan enjoys dabbling in Knot Theory. John is a Forest Dot for National Project NExT. He lives in Marietta with his wife Tracy, their two daughters Fredley and Lynncoln and their Jack Russell – Beagle mix dogs Nikki and Leia.

Susanna S. Epp, DePaul University

Susanna S. Epp (Ph.D., University of Chicago, 1968) is Vincent de Paul Professor of Mathematical Sciences at DePaul University. After initial research in commutative algebra, she became interested in cognitive issues associated with teaching analytical thinking and proof and has published a number of articles and given many talks related to this topic. She is the author of *Discrete Mathematics with Applications* and is co-author of *Precalculus and Discrete Mathematics*, which was developed as part of the University of Chicago School Mathematics Project. Long active in the Mathematical Association of America, she is a co-author of *CUPM Curriculum Guide 2004* and is now the content editor of *Illustrative Resources for CUPM Guide 2004*, an online supplement to the *Guide*. In January 2005 she received the Louise Hay Award for contributions to mathematics education.

David Bressoud, Macalester College

David Bressoud is DeWitt Wallace Professor of Mathematics at Macalester College and President-Elect of the Mathematical Association of America. He served in the Peace Corps, teaching math and science at the Clare Hall School in Antigua, West Indies before studying with Emil Grosswald at Temple University and then teaching at Penn State for 17 years. He chaired the Department of Mathematics and Computer Science at Macalester from 1995 until 2001. He has held visiting positions at the Institute for Advanced Study, the University of Wisconsin-Madison, the University of Minnesota, Université Louis Pasteur (Strasbourg, France), and the State College Area High School.

David has received the MAA Distinguished Teaching Award (Allegheny Mountain Section), the MAA Beckenbach Book Award for *Proofs and Confirmations*, and has been a Pólya Lecturer for the MAA. He is a recipient of Macalester's Jefferson Award. He has published over fifty research articles in number theory, combinatorics, and special functions. His other books include *Factorization and Primality Testing*, *Second Year Calculus from Celestial Mechanics to Special Relativity*, *A Radical Approach to Real Analysis* (now in 2nd edition), *A Radical Approach to Lebesgue's Theory of Integration*, and, with Stan Wagon, *A Course in Computational Number Theory*.

His cousin, Tom Bressoud, teaches Computer Science at Denison.

Wiebke Diestelkamp, University of Dayton

Wiebke Diestelkamp studied at the Georg-August-Universität in Göttingen and the Universität Ulm before coming to the University of Wisconsin – Milwaukee, where she earned an MS and a PhD in mathematics. She joined the University of Dayton in 1998, and she is currently an Associate Professor of Mathematics. Wiebke was a Project NExT fellow, and she has been an active Ohio NExT fellow as well. Wiebke became involved in the leadership of Ohio NExT when she became program co-chair in 2005 (with Chris Swanson). Since 2007, Chris Swanson, John Prather and Wiebke have been the Ohio NExT coordinators. Wiebke has also been a co-organizer (with Aparna Higgins) of Undergraduate Mathematics Day, a biennial undergraduate conference at the University of Dayton.

Contributed Paper Sessions

Friday, October 24 ***= student speaker**

Time	Troutman 112 Session Chair Phil Blau	Troutman 114 Session Chair Brian Shelburne	Notes
4:10-4:25	*On a variation of Playfair's Postulate* Abstract 1 Mark A Miller Marietta College	*A Mathematical Experiment in Perspective Drawing* Abstract 2 Anna A Davis Ohio Dominican University	
4:30-4:45	*The property of saturation of some family of vector fibre bundle* Abstract 3 Iskander Kapshayev Bowling Green State University	*Critical Thinking: The Vital Connection among Math Courses* Abstract 4 Dr. Isidoro Talavera Franklin University	
4:50-5:05	*Matrices with Prescribed Marginals* Abstract 5 M B Rao University of Cincinnati	*Hard But Not Too Hard - Students Prefer Challenging Courses* Abstract 6 Krista B Hands Ashland University	
5:10-5:25	*What kind of structure do zero-divisors have?* Abstract 7 Thomas J Cuchta* Marshall University	*Preparing students in the art of oral communication* Abstract 8 Lew Ludwig Denison University	
5:30-5:45	*Riemann Hypothesis* Abstract 9 Olusegun M Otunuga* Marshall University	*A Combinatorial Identity via ArcTan(x)* Abstract 10 Thomas P Dence Ashland University	
5:50-6:05	*Slope and Series from the 14th Century* Abstract 11 Philip Blau Shawnee State University	*Where to buy a house?* Abstract 12 Aurel I Stan Ohio State University - Marion	

Contributed Paper Sessions

Saturday, October 25 ***= student speaker**

Time	Ruff Learning Center 05 Session Chair Adam Parker	Troutman 114 Session Chair Jane Baldwin	Notes
10:25-10:40	*Capstone Seminar Swap Session* Abstract 13 CONCUR	*An Ischemic Detection of ECG* Abstract 14 Maiko Arichi* The University of Akron	
10:45-11:00	*Capstone Seminar Swap Session* Abstract 13 CONCUR	*Continual Compounding of a Conventional Mortgage* Abstract 15 William M Wagner	
11:05-11:20	*Calculus Communication Circles* Abstract 16 Judith A. Palagallo The University of Akron	*A Stochastic Model of Tuberculosis* Abstract 17 John T Holodnak* Ohio Northern University	
11:25-11:40	*Assessment - Required; Worthwhile? - Yes!* Abstract 18 Anne G Albert The University of Findlay	*Contraction to Traveling Waves* Abstract 19 Champike Attanayake Miami University – Middletown	

Abstracts of Contributed Papers

Friday 4:10 – 4:25

On a variation of Playfair's Postulate

Mark A Miller
Marietta College

Abstract 1: Recall that an affine plane is a linear space satisfying the following condition, known as Playfair's Postulate, "Given a line, l, and a point, p, not on l, there exists a unique line, m, through p, parallel to l." Playfair's Postulate is a variation on Euclid's fifth postulate, and in this sense, affine planes are generalizations of the Euclidean plane. With this motivation we consider the following definition giving a further generalization. Let P and L be (not necessarily distinct) sets. Let I be a relation on P x L and let I^C be the complement of I in P x L. Let J be a relation on L x L. We say S = (P, L, I, J) is a Generalized Playfair Structure provided the following condition, called the GPS Axiom, holds: "Given any (p, l) in I^C, there exists a unique m in L such that (p, m) is in I and (l, m) is in J." We consider various examples of Generalized Playfair Structures.

A Mathematical Experiment in Perspective Drawing

Anna A Davis
Ohio Dominican University

Abstract 2: Leonardo's treatise on painting includes an extensive discussion of perspective. Leonardo suggests that to study perspective we use "a pane of glass through which are seen various objects which you draw [directly] on [the glass]". This talk will address a mathematical experiment inspired by Leonardo's description. The experiment was assigned to students in a freshman interdisciplinary seminar. Students drew model railroad tracks viewed through a pane of glass. Students collected measurements from their drawings then plotted and interpreted their data. This talk will address the data collection process and the function that arises from the theory behind this experiment.

Friday, 4:30-4:45

The property of saturation of some family of vector fibre bundle

Iskander Kapshayev
Bowling Green State University

Abstract 3: The families of morphisms of vector fibre bundle defined by the linear systems of differential equations with non-negative coefficients are considered. Author proved that the specified families of morphisms are not saturated (V. Millionschikov).

Critical Thinking: The Vital Connection among Math Courses

Dr. Isidoro Talavera
Franklin University

Abstract 4: The goal of my talk is to sketch a proposal that seeks to improve the theory and practice of mathematical education at all levels by highlighting the common ground of our mathematics courses: critical thinking. By explicating this vital connection among math courses, I hope to show that one can actively promote key aspects of critical thinking across the math curriculum so that understanding may rise to the top--empowering the learner and instructor alike to grasp, interpret, and extend the subject of mathematics beyond the limits of everyday classroom experience.

Friday, 4:50-5:05

Matrices with Prescribed Marginals

M B Rao
University of Cincinnati

Abstract 5: The collection of all doubly stochastic matrices of fixed order is a compact convex set. The celebrated Birkhoff-von Neumann theorem avows that the extreme points of this convex are all the permutation matrices. We generalize this result in two directions. We characterize the extreme points.

Hard But Not Too Hard - Students Prefer Challenging Courses

Krista B Hands
Ashland University

Abstract 6: Some professors claim college students seek the easy way out and prefer classes that lack challenge. Results from the study show the opposite to be true as well as reasons for students preferring challenging courses.

Friday, 5:10-5:25

What kind of structure do zero-divisors have?

Thomas J Cuchta
Marshall University

Abstract 7: In commutative ring theory, the set of zero-divisors, Z(R), is a set with little algebraic structure. However, this set has incredible graphical structure when one creates a graph out of the zero-divisors by letting the vertices of the graph be the actual zero-divisors, and let the edges be formed between the vertices if the product of the two respective zero-divisors is zero. This talk will review the major theorem that kicked off research in this field, and some interesting theorems the author discovered during summer research at the 2008 Wabash College REU.

Preparing students in the art of oral communication

Lew Ludwig
Denison University

Abstract 8: The number of student presentations at regional and national meetings continues to rise. Some of these presentations are great, others could use some work. Here we will present several approaches for preparing students for their first math talk. These techniques range from in-class instruction to the use of on-line resources.

Friday, 5:30-5:45

Riemann Hypothesis
Olusegun M Otunuga
Marshall University

Abstract 9: During my research on Riemann Hypothesis, I designed a formula which can evaluate the Riemann-zeta function ?(s) = 1 + 1/2s + 1/3s + 1/4s + ... for the case where s is even. This formula is easy to compute without using a calculator or any computer software.

A Combinatorial Identity via ArcTan(x)
Thomas P Dence
Ashland University

Abstract 10: I'll show you a closed formula for the sum across any row in Pascal's Triangle that incorporates an alternating harmonic flavor. In the meantime, references will be made to Newton, Euler, and D. Hunt.

Friday, 5:50-6:05

Slope and Series from the 14th Century
Philip Blau
Shawnee State University

Abstract 11: This talk will discuss the contributions of the French scholastic Nicole Oresme (c. 1323-1382) to the study of infinite series and of the slope of a linear graph. A few assignments that attempt to expose students to his work while learning these concepts will be mentioned.

Where to buy a house?
Aurel I Stan
Ohio State University - Marion

Abstract 12: We consider the following problem. A man's job requires him to drive to three cities A, B, and C. Every working day, in the morning, he leaves his house and drives to one and only one of the three cities A, B, and C, works there the entire day, and returns home in the evening. If during a fixed period of time (like a week or month) he must go a times to the city A, b times to the city B, and c times to the city C, then where should the man buy his house, in order to minimize his total time of driving (and amount of money spent on gas)? We also assume that wherever he chooses to live, there are three almost straight line highways connecting him to the cities A, B, and C. This problem reduces to a weighted Fermat (Torricelli) point.

Saturday, 10:25-10:40

Capstone Seminar Swap Session
CONCUR
Facilitator: Adam Parker
Wittenberg University

Note: This swap session is held over two 15-minute time slots. Feel free to attend one or both sessions.

Abstract 13: Recently the Ohio Committee on Curriculum (CONCUR) completed a survey of undergraduate mathematics curricula across the states and it became clear that one area of growth, significant creativity, and large potential within the major was in capstone experiences. Topics covered in these courses are extremely varied. We know of capstone courses being taught as problem solving seminars, as math history courses, as research seminars, or as "mathematical book clubs" to name just a few. CONCUR felt the section would benefit from a forum designed to learn what our colleagues do in their school's capstones and share our own experiences.

If you either teach a capstone class or are considering creating one for your majors, we hope you attend. CONCUR will have descriptions of some seminars from outside the Ohio Section, and we hope that you will provide ideas and / or syllabi to share with others.

An Ischemic Detection of Electrocardiograms using the Discrete Hermite Transform

Maiko Arichi
The University of Akron

Abstract 14: An automated identification technique was developed for the detection of ischemic episodes in long term electrocardiographic (ECG) signals using mathematical expansions involving the discrete dilated Hermite Transform. The discrete Hermite functions are generated as eigenvectors of a symmetric tridiagonal matrix that commutes with the centered Fourier matrix. The Hermite transform values are computed from a simple dot product between an individual ECG complex extracted from the European Society of Cardiology (ESC) ST-T database and the corresponding the discrete Hermite function. These coefficients are found to contain information about the ECG shape, highlighting changes between ST-segment deviation and T-wave alterations which are the features of ischemic episodes.

Saturday, 10:45-11:00

Capstone Seminar Swap Session

CONCUR

See Abstract 13.

Continual Compounding of a Conventional Mortgage

William M Wagner

Abstract 15: L: Mortgage Loan; e.g. $100,000. T: Term in periodic units of time; e.g. 15 years. R%: Rate of periodic interest; e.g. 6%/annum. A: Amount of payment over one unit of time. P: Principal: P(0)=L; P(T)=0. The recursion relation for discrete compounding is: P(i+1)=P(i)[1+R%/m]-A/m where m is the number of intervals per unit of time. As the cycle, (1/m), of compounding and payments approaches zero, the resulting limit is the first order linear O.D.E.: -dP/dt=-R%P+A having the integration factor: exp(-R%t). It shall be shown that: I (Definition) The Amplification Factor of the Loan for total payments is: (AT/L)=R%T/[1-exp(-R%T)]; Here the Total Payment, AT, is: $151,660.60-. II Integral[0,T;(-R%P+A)]=L; Analogy: Sum of principal reductions equals L. III R%Integral[0,T;P] equals the total interest: (AT-L).

Saturday, 11:05-11:20

Calculus Communication Circles

Judith A. Palagallo
The University of Akron

Abstract 16: In order to assist and encourage Advanced Placement calculus teachers in northern Ohio, we formed a Calculus Communication Circle (CCC). The primary goals of the Circle are to get acquainted with the AP calculus teachers in our area and to share ideas about mathematics and the teaching of calculus. CCC will offer workshops for teachers and will collect and disseminate teaching materials. We will discuss our first two meetings of CCC and our plans for the future. This project is a collaboration with Tom Dence of Ashland University.

A Stochastic Model of Tuberculosis

John T Holodnak
Ohio Northern University

Abstract 17: In this talk, we examine a six-class stochastic model of tuberculosis adapted from a system of ordinary differential equations. Through cellular automaton simulations, we implement treatment and vaccination in an effort to control the disease, and investigate the importance of incorporating the movement of individuals into the simulation. Additionally, we compare results obtained with and without the assumption of exogenous re-infection.

Saturday, 11:25-11:40

Assessment - Required; Worthwhile? - Yes!

Anne G Albert
The University of Findlay

Abstract 18: Do you nominate yourself for the assessment committee? Can you not wait for the next assessment you are required to do? Although I am not eager to do assessment, I have found some value in the grant assessment, course assessments, program assessment, and accreditation assessments that I have done in the last year. What have I learned? I will present a few examples of the changes in my classes that have come from the assessments. It is always exciting to improve our teaching and our students' learning!

Contraction Properties and Numerical Approximations of Traveling Waves

Champike Attanayake
Miami University – Middletown

Abstract 19: In this talk I like to discuss the contraction properties of numerical solutions to the Huxley's equation. The use of the contraction properties yield long-time a posteriori estimates on the numerical error instead of a priori estimates.