Program of Activities
For the Fall Meeting of the

Mathematical Association of America

Ohio Section

Fall, 2006
Muskingum College
New Concord, Ohio
October 27 – 28, 2006

MAA Ohio Section
Program

*Except where noted, all activities will take place in the **Boyd Science Center (BSC).***

Friday, October 27, 2006

12:00 – 4:30	Registration	Lobby
1:00 – 4:30	Book Exhibits	Lobby
12:15 – 1:15	Committee Meetings: CONSTUM CONCUR CONTEAL CONSACT	 BSC 338 BSC 229 BSC 219 BSC 305
1:30 – 1:45	Welcome and Announcements	BSC 343
1:45 – 2:45	Invited Address: **"Focusing on the Critical Points of Polynomials"** David Singer, Case Western Reserve University	BSC 343
2:45 – 3:15	Break	Lobby
3:15 – 4:15	CONCUR Panel Discussion: **"Future of the Entire College-Level Mathematics Curriculum"** Moderator: Cathy Stoffer, Ashland University	BSC 343
4:25 – 6:00	**Contributed Paper Sessions**	BSC 202 BSC 204
4:25 – 6:00	Executive Committee Meeting	BSC 338
6:00 – 6:30	Social Time	Student Faculty Center (BOC)
6:30 – 7:45	Banquet	Student Faculty Center
7:50 – 8:30	Invited Address: **"Understanding the Thurston Model of Hyperbolic Space"** Curtis Bennett, Loyola Marymount University	Student Faculty Center

*Saturday activities will take place in the **Boyd Science Center (BSC).***

Saturday, October 28

8:00 – 10:30	Registration and Book Exhibits	Lobby
8:00 – 8:50	Coffee and Donuts	Lobby
8:05 – 8:50	Executive Committee Meeting (if necessary)	BSC 338
9:00 – 10:00	Invited Address: **"The Joy of Solving Equations"** Bernd Sturmfels, University of California, Berkeley	BSC 343
10:00 – 10:30	Break	Lobby
10:35 – 11:30	**Contributed Paper Sessions**	BSC 202 BSC 204
11:40-12:40	Invited Address: **"Averaging, Discrete Means, Coalition Building, and a Paradox of Social Choice"** Curtis Bennett, Loyola Marymount University	BSC 343
12:40	Closing Remarks	BSC 343

Abstracts of Invited Addresses

Friday

Speaker: David Singer
Title: *Focusing on the Critical Points of Polynomials*
Abstract: An early result in freshman calculus locates the critical point of a quadratic polynomial at the midpoint of the interval joining its two zeroes; this even remains true when the roots are complex. Not as well known, though, is a theorem of Bocher and Grace which locates the critical points of a cubic polynomial at the foci of a certain ellipse. This talk will explore the geometry of this result and some of its generalizations.

CONCUR Panel Discussion
Moderator: Cathy Stoffer
Panelists: Marsha Guntharp, Richard Little, Carol Phillips-Bey, Harold Putt
Title: *Future of the Entire College-Level Mathematics Curriculum*
Abstract: Panelists will be addressing curriculum issues in different concentration areas, such as math education, the mathematics major, computational science, actuarial science major, mathematical economics, etc.

Speaker: Curtis Bennett
Title: *Understanding the Thurston Model of Hyperbolic Space*
Abstract: A common model of hyperbolic space, introduced by Bill Thurston and mentioned in *The Shape of Space* by Jeff Weeks, involves gluing together equilateral triangles so that 7 meet at every vertex. In *The Heart of Mathematics*, Ed Berger and Michael Starbird pose the question of drawing a large triangle on this space and measuring its angles. Drawing such a triangle turns out to be curiously difficult. In this talk we will investigate why this is difficult, taking a tour through Pick's Theorem, Euler's Formula, and the relationship between lines in the model and lines in hyperbolic space.

Saturday

Speaker: Bernd Sturmfels
Title: *The Joy of Solving Equations*
Abstract: Gröbner bases are a fun method for solving algebraic equations. See how it works, why it is useful, and what you should do with the change in your pocket.

Speaker: Curtis Bennett
Title: *Averaging, Discrete Means, Coalition Building, and a Paradox of Social Choice*
Abstract: What would be an example of a family with an *average* number of 1.7 children? Alternatively, suppose members of a department all wanted to donate the same dollar amount to a worthy cause (like the MAA), but would vote to decide how much. In this talk we shall look at such questions and how coalitions can distort the traditional average. We shall then look at what axioms a mean on a discrete set should satisfy to avoid the danger of coalition building, the implications of these axioms, and a paradoxical result.

Brief Biographies of Invited Speakers

Curtis Bennett, Loyola Marymount University
Curtis Bennett received his Ph.D. from the University of Chicago in 1990. He held postdoctoral positions at Michigan State University and Ohio State University. In 1993, Curtis started teaching at Bowling Green State University. In 2002, he moved to Loyola Marymount University where he was recently promoted to full professor. Curtis was a 2000-01 and 2003-04 Carnegie Academy for the Scholarship of Teaching and Learning fellow. While a member of the Ohio Section of the MAA, Curtis served on CONSTUM, and chaired the committee in 2001-2002. In 2004, he became the Secretary-Treasurer of the Southern California-Nevada Section of the MAA, and he is currently the Secretary of that section. His mathematical interests include group theory, finite (and infinite) geometries, buildings, combinatorics, mathematical puzzles and games, and the teaching and learning of mathematics. He has been published in the American Mathematical Monthly, Mathematics Magazine, and Math Horizons, as well as various journals in combinatorics and algebra.

David Singer, Case Western Reserve University
David Singer learned mathematics from his mother, and at the University of Pennsylvania, where he received his Ph.D. in 1970. Since 1975 he has taught mathematics and done research in differential geometry at Case Western Reserve University in Cleveland, Ohio. He is the author of one book, *Geometry: Plane and Fancy,* and numerous articles. In recent years he has particularly enjoyed teaching number theory and cryptology to students in mathematics and computer science and working with high school mathematics teachers during the summer. At home he enjoys playing the piano and playing with his three grandchildren.

Bernd Sturmfels, University of California, Berkeley
Bernd Sturmfels is a 2005-2007 Pólya Lecturer. He received doctoral degrees in Mathematics in 1987 from the University of Washington, Seattle, and the Technical University Darmstadt, Germany. After two postdoctoral years at the Institute for Mathematics and its Applications, Minneapolis, and the Research Institute for Symbolic Computation, Linz, Austria, he taught at Cornell University, before joining UC Berkeley in 1995, where he is Professor of Mathematics and Computer Science. His honors include a National Young Investigator Fellowship, a Sloan Fellowship, and a David and Lucile Packard Fellowship. Sturmfels served as von Neumann Professor at TU Munich in Summer 2002, as the Hewlett-Packard Research Professor at MSRI Berkeley in 2003/04, and he was a Clay Senior Scholar in 2004. A leading experimentalist among mathematicians, Sturmfels has authored or edited 13 books and about 150 research articles, in the areas of combinatorics, algebraic geometry, symbolic computation and their applications. He currently works on algebraic methods in statistics and computational biology.

CONCUR Panelists

Cathy Stoffer, Ashland University
Cathy has worked on revising the mathematics content courses for early childhood and middle grades mathematics concentration licensure candidates at Ashland University. She was instrumental in the revision of the mathematics curriculum for secondary mathematics teacher licensure candidates at Ashland and has written the curriculum for the secondary mathematics methods course. Cathy has served the Ohio Section as the chair of CONTEAL and is currently serving on CONCUR.

Marsha Guntharp, Capital University
At Capital University, teacher education candidates are required to take a course in college geometry and in history of mathematics, two courses not required for the regular mathematics majors. A course specifically designed for the middle-childhood education preservice teachers is one, which Marsha developed with grant money from the Ohio Board of Regents. The course looks into the actual content of middle-childhood mathematics, but explores the mathematics at a deep and rich level.

Richard Little, Baldwin-Wallace College
Dick has worked on several initiatives with the Ohio Department of Education and Ohio Board of Regions over the past 30 years. While Baldwin-Wallace has not adopted much material from the CUPM 2004, they have a very viable program for secondary teachers, both a major in mathematical economics and a double major program in concert with their economics department, and a program for math teachers in grades 4-9. He has served on various facets of the ODE's OMAP program last summer and this summer, and on ODE's Program Models for secondary math curriculum last summer.

Carol Phillips-Bey, Cleveland State University
Carol's curriculum activities involve a collaborative program with two other universities along with education, science, and mathematics faculty to deliver professional development institutes for teachers in grades three through ten. Her other current work focuses on developing a chemistry-algebra set of learning modules as a project with the chemistry department. She is collaborating with both mathematics faculty and College of Education faculty in designing new courses for pre-service teachers. She was involved in creating three new courses for teacher licensure candidates – one at the undergraduate level, which focuses on the application of technology, and two at the graduate level.

Harold Putt, Ohio Northern University
Harold has been actively involved in significant revisions in the mathematics curriculum at ONU in the past decade. A number of curriculum revisions have followed the introduction of a three-track major in 1998. ONU now has minor programs in applied mathematics and applied statistics to complement their long standing minor in mathematics. This fall they introduced a fourth track to their major offerings. This "modified" mathematics major requires fewer courses than any other tracks. Harold established "Communication Teams" designed to foster communication between the mathematics department and various partner disciplines after becoming department chair.

Contributed Paper Sessions

Friday 4:25—6:00

Time	Session A Room 202, BSC Session Chair: Mark Miller	Session B Room 204, BSC Session Chair: Jon Stadler
4:25 – 4:40	**John Tynan** Marietta College *Excel Saves the Day*	**Iyad A. Ajwa** Ashland University *Applications of The Characteristic Sets Method*
4:45 – 5:00	**Allen Cox** Kent State University, Kent *Basic Differentiation Applied to a Multivariable Inequality*	**Lee T. Kennard** Kenyon College *Asymptotics on the Class Number*
5:05 – 5:20	**Prem Singh** Ohio University *Mathematics Education Using Classroom Assessment Techniques*	**Matthew C. Zaremsky** Kenyon College *Irreducible Representations of Metacyclic Groups: The Waffle Method*
5:25 – 5:40	**Thomas Hern** Bowling Green State University *A Calculus Seminar*	**Anna A. Davis** Ohio Dominican University *A Relative Version of Finiteness Obstruction of C.T.C. Wall*
5:45 – 6:00	**Daniel E. Otero** Xavier University *Redesigning a Mathematics Education Curriculum*	

Contributed Paper Sessions

Saturday 10:35—11:30

Time	Session A Room 202, BSC Session Chair: Harold Putt	Session B Room 204, BSC Session Chair: Bill Fuller
10:35 – 10:50	**Andrew J. Homan** Ohio Northern University *An Extension of a Putnam Problem*	**Thomas P. Dence** Ashland University *Do You Know the Constant $L = 2.622057$?*
10:55 – 11:10	**MB Rao** University of Cincinnati *Monty Hall Phenomenon - Stories and Controversies*	**Michael Wallace** *Solution to the Thomas Dence Problem*
11:15 – 11:30	**MB Rao** University of Cincinnati *Monty Hall Phenomenon - A Generalization*	**William R. Fuller** Ohio Northern University *Pythagorean Tangent Sequences*

Abstracts of Contributed Papers

4:25 – 4:40 Friday   **Session A – Room 202, BSC**

John Tynan, Marietta College

Excel Saves the Day

Abstract: While solving a standard max/min problem in Calculus the nonstandard answer did not have a nice closed form. Fortunately we were able to use Excel to model some of the answers to come up with an acceptable solution.

4:25 – 4:40 Friday   **Session B – Room 204, BSC**

Iyad A. Ajwa, Ashland University

Applications of The Characteristic Sets Method

Abstract: The Characteristic Sets (CS) Method is an advanced mathematical computation that was discovered by the Chinese mathematician Wentsun Wu in 1978. Wu rediscovered the CS method in the context of his work on the algebraization of geometry and mechanical geometry theorem proving. The CS method is the core of Wu's Method for Automated Geometry Theorem Proving where hundreds of non-trivial theorems have been proven and many new geometric relations have been derived. Other applications of the CS method include solving systems of equations, robotics, and computer vision.

4:45 – 5:00 Friday   **Session A – Room 202, BSC**

Allen Cox, Kent State University, Kent

Basic Differentiation Applied to a Multivariable Inequality

Abstract: As stated in a recent mathematics journal, a problem is proposed as: For positive real numbers a, b, and c, prove that

$$abc \le \frac{(a+b+c)^3 - (a^3+b^2+c^2)}{24} \le \frac{(a+b+c)^3}{27}.$$

Using basic properties of derivatives in single valued and multivariable calculus, I will show how this inequality can be proven in a simple and effective way. This talk is accessible to freshmen students and above.

4:45 – 5:00 Friday   **Session B – Room 204, BSC**

Lee T. Kennard, Kenyon College

Asymptotics on the Class Number

Abstract: If x and y are integers, what numbers can be represented by the form $x^2 + y^2$? What about $5x^2 + 6xy + 2y^2$? Interestingly, the answers to both questions are the same. Furthermore, this has something to do with the fact that both have the same discriminant. Carl Gauss and other mathematicians have studied questions like this in a general context by looking at polynomials of the form $f(x, y) = ax^2 + bxy + cy^2$. The examples above turn out to be in the same equivalence class. In my talk, I will define what it means for two forms to be equivalent, show how to count the number, called class number, of equivalence classes, and discuss the results my REU group obtained this summer on the asymptotics of the class number.

5:05 – 5:20 Friday   **Session A – Room 202, BSC**

Prem Singh, Ohio University

Mathematics Education Using Classroom Assessment Techniques

Abstract: This presentation will focus on how to facilitate the teaching/learning of mathematics using classroom assessment techniques. These techniques will help students take charge of their learning in and outside of classroom

5:05 – 5:20 Friday   **Session B – Room 204, BSC**

Matthew C. Zaremsky, Kenyon College

Irreducible Representations of Metacyclic Groups: The Waffle Method

Abstract: The waffle method is a highly visual, very useful tool for finding every irreducible representation of any metacyclic group. Irreducible representations allow these abstract groups to be inspected with the tools of linear algebra, something that can reveal many previously unseen facts about the group structure. The waffle method can also be applied to certain wreath products of cyclic groups, exposing these groups to the possibilities of linear algebra, just like the metacyclics. This method is particularly desirable for its visual simplicity: all the information about the irreducible representations is contained in a diagram that just looks like a basic breakfast waffle.

5:25 – 5:40 Friday   **Session A – Room 202, BSC**

Thomas Hern, Bowling Green State University

A Calculus Seminar

Abstract: We describe a seminar at BGSU geared toward providing a vehicle for sharing of experience and ideas between experienced instructors and those who are new or have modest experience—a substitute for not having Cliff Long and Fred Rickey around anymore. This can involve larger issues as well as concrete day-to-day problems. The weekly seminar has been ongoing for several years and tenure-track faculty, instructors, visitors and advanced graduate students have participated.

5:25 – 5:40 Friday   **Session B – Room 204, BSC**

Anna A. Davis, Ohio Dominican University

A Relative Version of Finiteness Obstruction of C.T.C. Wall

Abstract: C. T. C. Wall demonstrated that if a CW complex Y is finitely dominated, then the reduced projective class group of Y contains an obstruction which vanishes if and only if Y is homotopy equivalent to a finite CW complex. Wall demonstrated that such an obstruction is invariant under homotopy equivalences. Subsequently Sum and Product Theorems for this obstruction were proved by L. C. Siebenmann. Wall's paper also gives an algebraic definition of relative finiteness obstruction. In this paper we will use a geometric construction to reduce the relative finiteness obstruction to the non-relative version. We will demonstrate that the relative finiteness obstruction is invariant under certain types of homotopy equivalences. We will also prove the relative versions of the Sum and Product Theorems.

5:45 – 6:00 Friday   **Session A – Room 202, BSC**

Daniel Otero, Xavier University

Redesigning a Mathematics Education Curriculum

Abstract: Beginning in 2004, members of the Mathematics & Computer Science department at Xavier University have been working to redesign their curriculum to support undergraduate students in programs of mathematics education. In particular, a number of new courses were instituted to meet the needs of future middle school mathematics teachers. This talk will describe the new curriculum which was launched this fall, the steps that were taken to put it into place, and ongoing issues that have arisen as the curriculum comes on line.

10:35 – 10:50 Saturday   **Session A – Room 202, BSC**

Andrew J. Homan, Ohio Northern University

An Extension of a Putnam problem

Abstract: We revisit the problem B1 of the 1973 Putnam Competition, on which a number of papers have already been written. In that problem, $2n+1$ integers are given with the property that any $2n$ of them can be divided into two groups of n with equal sums. The problem requires to prove that the $2n+1$ integers are all equal. It turns out that the result holds for $2n+1$ elements of any field of characteristic zero. Our talk will address the possibilities and limitations of extending this result to fields of finite characteristic.

10:35 – 10:50 Saturday   **Session B – Room 204, BSC**

Thomas P. Dence, Ashland University

Do You Know the Constant $L = 2.622057$?

Abstract: The world's most famous constant, π, hails from a geometry background. Here is another constant, with a similar background, that hasn't had the same press, and rightly so, but it is still interesting in its own right.

10:55 – 11:10 Saturday   **Session A – Room 202, BSC**

MB Rao, University of Cincinnati

Monty Hall Phenomenon – Stories and Controversies

Abstract: A decade ago, the Automobile-Goats problem has taken the country by storm. In a game show, there are three closed doors on the stage, behind one of which there is an automobile and behind the other two doors a goat each. The host of the game show knows exactly what is behind each door. An invited participant of the show chooses a door. The host opens one of the other two doors exhibiting a goat. The participant is given a choice: stick to the initial selection or choose the remaining unopened door. Whatever be the final choice, the participant gets what is behind it. Which one is a better strategy: stick to the initial selection or switch doors? In this talk, a review of controversies, stories, and history surrounding the problem will be presented.

10:55 – 11:10 Saturday   **Session B – Room 204, BSC**

Michael Wallace

Solution to the Thomas Dence Problem

Abstract: At the Fall, 2005 Section Meeting, President Bill Benz of host Ashland University proposed the following problem: If the sum of *A*, *B*, and *C* is 6, the sum of their squares 8, and the sum of their third powers 5, find the sum of their fourth powers. At the next Meeting, in Spring, 2006 at the University of Akron, Tom Dence showed how to find the solution (0), and offered the Section a new problem: If the sum of *A*, *B*, *C*, and *D* is 3, the sum of their squares 7, their cubes 9, and their fourth powers 11, find the sum of their fifth powers. In this talk we show how to solve Dr. Dence's problem without breaking the symmetry between the variables. This leads to discovering a general formula for solving all such problems. Will this mean the end of the chain of problem proposing? Maybe not.

11:15 – 11:30 Saturday   **Session A – Room 202, BSC**

MB Rao, University of Cincinnati

Monty Hall Phenomenon - A Generalization

Abstract: The three-door game-show problem has become part of our mathematical lore. A review of the problem and its solution will be expounded in a simple way. Some generalizations will be presented which will make transparent the solution of the three-door problem.

11:15 – 11:30 Saturday   **Session B – Room 204, BSC**

William R. Fuller, Ohio Northern University

Pythagorean Tangent Sequences

Abstract: Pythagorean tangent sequences provide a pleasing interface between geometry and number theory. The sequences will be presented and some of their properties will be discussed. The subject is one that students at a variety of levels can find interesting and can help them make a transition from geometric explorations to finding delight in more abstract discovery.

Notes

Acknowledgements

The Ohio Section would like to thank the faculty, staff, and students of the Mathematics Department at Muskingum College, for their efforts in hosting this meeting. Special thanks go to Richard Daquila, the Chair of the Local Arrangements Committee.

The Section also wishes to thank John Carroll University for providing the funds to print this program, as well as the exhibitors for their support of the meeting.

Save these Dates!

The spring meeting of the Ohio Section will be held at Shawnee State University on **April 13-14, 2007**. Featured speakers include
- Francis Su, Harvey Mudd College
- Thomas Dence, University of Akron

The Joint Mathematics Meetings will be in New Orleans, **January 5-8, 2007**. Registration deadlines for housing and mailing of program: November 14, 2006.

The fall meeting of the Ohio Section will be held at Wittenberg University on **October 19-20, 2007**.