Program of Activities
For the Fall Meeting of the

Mathematical Association of America

Ohio Section

Fall, 2003
Ohio Northern University
Ada, Ohio
October 17-18, 2003

MAA Ohio Section

Program

*Except where noted, all Friday activities will take place in the **McIntosh Center.***

Friday, October 17, 2003

12:00—4:30	Registration, book exhibits	Main Lounge
12:15—1:15	Committee Meetings:	
	CONCUR	Conference Room 202
	CONSACT	Conference Room 203
	CONSTUM	Conference Room 204
	CONTEAC	Conference Room 205
	Department Liaisons Meeting	Board Room
	Department Chairs Meeting	Conference Room 7
1:30—1:45	Welcome & announcements	Activities Room
1:45—2:45	Invited Address: **"Rearranging the Alternating Harmonic Series"** Carl Cowen, Purdue University, President-Elect of the MAA	Activities Room
2:45—3:15	Break & refreshments	Main Lounge
3:15—4:05	Invited address: **"Some Geometric Gems via Möbius Transformations"** David Minda, University of Cincinnati, 2002 Section Teaching Award Winner	Activities Room
4:15—5:30	**Contributed Paper Sessions**	Rooms 207 & 208, Science Annex
4:15—5:50	Executive Committee Meeting	Board Room
6:00—6:30	Social Time	Wishing Well
6:30—7:45	Banquet	Wishing Well
7:50—8:40	After-dinner talk: **"Connections Between Mathematics and Biology"** Carl Cowen	Activities Room

*Saturday activities will take place in **Meyer Hall** and the **Science Annex**.*

Saturday, October 18

8:00—10:30	Registration, book exhibits	West Lobby, Meyer Hall
8:00—8:50	Coffee & donuts	West Lobby, Meyer Hall
8:05—8:45	Committee meeting continuations (if necessary)	Room 203, Meyer Hall Room 201, Science Annex Room 216, Science Annex
8:50—9:00	Announcements	Room 107, Meyer Hall
9:00—10:00	Invited address: **"A Prime AIME Problem"** Leo Schneider, John Carroll University	Room 107, Meyer Hall
10:00—10:30	Break & refreshments	West Lobby, Meyer Hall
10:30—11:30	CONTEAC presentation: **"Undergraduate Early Childhood and Middle Childhood Teacher Licensure in Ohio"** Cathy Stoffer, Ashland University	Room 107, Meyer Hall
10:30—11:25	Contributed Paper Session	Room 207, Science Annex
11:40—12:40	Invited address: **"Lights (over and) Out"** Jon Stadler, Capital University	Room 107, Meyer Hall
12:40	Closing remarks	Room 107, Meyer Hall

Abstracts of Invited Addresses

Speaker: Carl Cowen, Purdue University
Title: *Rearranging the Alternating Harmonic Series*
Abstract: The commutative property of addition is so familiar to all of us as school children that it comes as a shock to those studying college level mathematics that NOT all "natural extensions" of the law are true! One of the first instances that we see the failure of an extended commutative law of addition is in infinite series. Often in the introduction to infinite series in calculus, one sees Riemann's Theorem: *A conditionally convergent series can be rearranged to sum to any number.* Unfortunately, the usual proof of this theorem does not indicate what the sum of a given rearrangement is. In this talk, we will examine the best known conditionally convergent series, the alternating harmonic series, and show how to find the sum of any rearrangement in which the positive terms and the negative terms are each in their usual order.

Speaker: David Minda, University of Cincinnati
Title: *Some Geometric Gems via Möbius Transformations*
Abstract: A number of striking results in Euclidean plane geometry have elegant proofs using Möbius transformations. Several of these geometric gems will be presented. The basics of Möbius transformations will be introduced before the geometric results are given, so the talk will be accessible to anyone with an interest in geometry. Möbius transformations can be viewed as an analog of Euclidean isometries. The group of Euclidean isometries of the plane is generated by reflections over lines, while Möbius transformations are generated by both reflections over lines and reflections over circles. Orientation preserving Möbius transformations are often discussed in an undergraduate complex variables class since they have a simple expression in terms of complex numbers.

Speaker: Carl Cowen, Purdue University
Title: *Connections between Mathematics and Biology*
Abstract: Dr. Rita Colwell, a research microbiologist and current Director of the National Science Foundation, regards the mathematical sciences as the backbone for US Scientific and Engineering research. Many scholars see the next few decades as a time of intensive progress in the biological sciences. Dr. Colwell sees mathematics as being an integral part of the progress in biology, not a traditional view, but a forward looking one. In this talk, Carl Cowen will outline some of the research areas in the emerging collaborations between mathematical and biological scientists. In addition, Cowen, currently studying the mathematics of neuroscience in the Purdue Biology Department and at the Mathematical Biosciences Institute at Ohio State University, will illustrate the connection between mathematics and neuroscience with a discussion of the Pulfrich phenomenon, an experiment that helps illuminate how the brain processes visual images. There are few mathematical or biological prerequisites for this discussion.

Speaker: Leo Schneider, John Carroll University
Title: *A Prime AIME Problem*
Abstract: During my years on the MAA's national high school contest committee, one of the problems I authored for the American Invitational Mathematics Examination maximized the correlation with the overall results for that year's problems. Let's solve it. Then I will discuss its connections with: (a) a proof of a theorem occasionally seen in number theory texts; (b) that proof's second order connection with the Ohio Section; and (c) a very direct connection with this fall's Ohio Section meeting.

Speaker: Cathy Stoffer, Ashland University
Title: *Undergraduate Early Childhood and Middle Childhood Teacher Licensure in Ohio*
Abstract: CONTEAC has conducted a study of the undergraduate early childhood and middle childhood teacher licensure programs in Ohio to answer the questions: What courses are required? How are these courses taught? Are the programs meeting NCTM's *Professional Standards* and the recommendations of the MET Report? The data has been compiled and will be shared.

Speaker: Jon Stadler, Capital University
Title: *Lights (Over and) Out*
Abstract: Lights Out is a handheld puzzle produced by Tiger Electronics. Played on a 5x5 array of buttons/lights, its solution is rich in linear algebra and combinatorics. We will investigate and solve fictitious versions of Lights Out by exploiting the solution to the original puzzle. The first version generalizes the original puzzle by allowing each light to take on integer values. We then will use this solution to demonstrate how to play when the lights take values selected from any group whose elements can be written as a finite product of generators. We will conclude by solving one such puzzle, Lights Over and Out.

Brief Biographies of Invited Speakers

Carl Cowen, Purdue University

Carl Cowen was educated at Hanover College, Indiana University, University of Warwick, and received his Ph.D. in pure mathematics from the University of California, Berkeley. Following a post-doc position and teaching experiences in junior high school and small colleges, he has been at Purdue since 1978, where he served as Head of the Mathematics Department from 1997 to 2002.

For many years, his primary research interests have been in operator theory and complex analysis, specifically, studying the operator on spaces of analytic functions given by composition with a fixed function. His primary pedagogical interests have been in teaching linear algebra, both to math majors and to engineering students. Last year, Carl spent a sabbatical year at the Mathematical Biosciences Institute at The Ohio State University where he began changing his research attention to the mathematics of neuroscience. This year he is working with biologists at Purdue to develop a mathematical model of parts of the sensory system of the medicinal leech.

Carl has been involved in each of the three major mathematical organizations, and is currently serving as First Vice President of the Mathematical Association of America. He recently won the MAA's election for President-Elect, and will begin serving as President of the MAA in 2005.

David Minda, University of Cincinnati

David Minda was born in Cincinnati and obtained his BS (1965) and MS (1966) in mathematics from the University of Cincinnati before leaving for the University of California at San Diego, where he received his Ph.D. in 1970. After a post-doctoral year at the University of Minnesota, he accepted a faculty position at the University of Cincinnati. His research and his teaching interests both focus on geometry. His research involves the use of hyperbolic geometry in complex analysis, and he enjoys teaching geometry classes for both pre-service and in-service math teachers.

David won the Dolly Cohen Award for Excellence in Teaching at UC in 2001, and in 2002 he received both the Ohio Section MAA Award for Distinguished College or University Teaching of Mathematics and the UC Honors Program Teacher of the Year Award.

Leo Schneider, John Carroll University

Leo received his B.S. and M.S. in mathematics from Xavier University in Cincinnati, and his Ph.D. from Case Western Reserve University in Cleveland, writing his thesis, *Oscillatory Properties of the Fourth Order Linear Self-Adjoint Differential Equation,* under Alan Lazer. He is now a Professor of Mathematics at John Carroll University, where he began as an Instructor in 1963.

Leo has served the Ohio Section in numerous capacities, including a 14-year stint as the Ohio Examination Coordinator for the MAA's American Mathematics Competitions, various committee memberships, President of the Section, and a three-year term as Ohio Section Governor. For the national MAA he served 12 years on the American High School Mathematics Committee, the last six as chair; he helped host the 2001 International Mathematics Olympiad in Washington, and also served as one of the 48 IMO coordinators (graders). He has been involved with the American Regions Mathematics League [ARML] for the past 17 years in various capacities (Test Construction Committee, Power Question Grader, Head Judge). This will be his fourth year as the author of the New York State Mathematics League [NYSML] state meet, and he has recently authored the annual Massachusetts Mathematical Olympiad. Currently, Leo is beginning his fifth year on the national Pi Mu Epsilon Council, and his second year as their national Secretary-Treasurer.

Jon Stadler, Capital University

Jon Stadler is Ohio through-and-through. After receiving his undergraduate degree from Bowling Green in 1992, he pursued his Ph.D. at The Ohio State University, receiving it in 1997. Jon taught at Coastal Carolina University in South Carolina for one year before returning to Ohio to teach at Capital University, where he is in his fifth year of teaching. Since returning to Ohio, he has been active in the Ohio MAA and the Ohio Project NExT.

Jon's areas of interest include enumerative combinatorics, number theory and calculus. Recently, he has enjoyed studying combinatorial game theory. He has been juggling for about 20 years and has been studying the mathematics of juggling for about half that time. This mixture of hobby and mathematics has provided him several opportunities to share his investigations of juggling patterns and their mathematical curiosities.

Contributed Paper Sessions

Friday 4:15—5:30

Time	**Session A** Room 207, Science Annex Session Chair: Barbara D'Ambrosia	**Session B** Room 208, Science Annex Session Chair: Vickie Van Dresar
4:15—4:30	**David Kullman** Miami University-Oxford *Milestones in Mathematics: 1803-2003*	**Thomas Dence** Ashland University *Constructions of Regular Pentagons*
4:35—4:50	**Michael T. Edwards** John Carroll University *The "Folded Triangles" Problem: Connecting Differential Calculus to Middle Grades Mathematics*	**Gary Kerns** Bowling Green State University *Exchangeability and de Finetti's Theorem*
4:55—5:10	**Carl Stitz** Lakeland Community College *Musings on the Product and Quotient Rules of Differential Calculus*	**Wendy Smith** Bowling Green State University *Using Laplace transforms to Solve Infinite Series*
5:15—5:30	**Christopher Swanson** Ashland University *Beware of Deranged Secret Santas Bearing Door Prizes*	**Mihai Caragiu** Ohio Northern University *What is a spooky slice from a Lucas number?*

Contributed Paper Sessions

Saturday 10:30—11:25

Time	**Session C** Room 207, Science Annex Session Chair: Bill Higgins
10:30—10:45	**Khristo Boyadzhiev** Ohio Northern University *What are polylogarithms?*
10:50—11:05	**Thomas Hern** Bowling Green State University *Searching for Madison College*
11:10—11:25	**Nathan Baxter** Ohio Northern University *On the partial sums of the Harmonic series*

Abstracts of Contributed Papers

4:15—4:30 Friday **Session A—Room 207, Science Annex**

David Kullman, Miami University-Oxford

Milestones in Mathematics: 1803-2003

Abstract: An Ohio Bicentennial tribute featuring notable events and personalities that helped to shape mathematics and mathematics education in Ohio.

4:15—4:30 Friday **Session B—Room 208, Science Annex**

Thomas Dence, Ashland University

Constructions of Regular Pentagons

Abstract: In this talk I'll show a few different methods for constructing a regular pentagon, which is a topic that arose last summer while teaching a History of Mathematics course. I'll finish off with a clever and interesting example.

4:35—4:50 Friday **Session A—Room 207, Science Annex**

Michael T. Edwards, John Carroll University

The "Folded Triangles" Problem: Connecting Differential Calculus to Middle Grades Mathematics

Abstract: In this talk, we highlight ways in which a seemingly ordinary first-year calculus problem, the "Folded Triangles" problem, may be recast as an exercise suitable for a wide range of students, from those in middle grades through college. Through the use of paper folding, by-hand algebraic manipulation, and dynamic geometry software, we present some results that even the most knowledgeable of math students (i.e. mathematics faculty) may find counterintuitive and intriguing!

4:35—4:50 Friday **Session B—Room 208, Science Annex**

Gary Kerns, Bowling Green State University

Exchangeability and de Finetti's Theorem

Abstract: The classical theorem of de Finetti says that an infinite sequence of exchangeable random variables is a mixture of independent and identically distributed random variables. The result happens to fail in general with finite sequences, for example, sequences that are negatively correlated. A simple geometric argument will be used to provide insight into the reason for the failure, and to simultaneously suggest that one needs only to consider an extended notion of "mixture" to recapture de Finetti's elegant representation.

4:55—5:10 Friday **Session A—Room 207, Science Annex**

Carl Stitz, Lakeland Community College

Musings on the Product and Quotient Rules of Differential Calculus

Abstract: I'd like to share with you some of my own and my students' experiences with the product and quotient rules from Differential Calculus. Many of these ideas (such as a proof of the quotient rule using the product rule without using the chain rule) were new to my fellow faculty at Lakeland, so I hope that some may be new to you! This talk is accessible to faculty AND first year students of the Calculus!

4:55—5:10 Friday **Session B—Room 208, Science Annex**

Wendy Smith, Bowling Green State University

Using Laplace transforms to Solve Infinite Series

Abstract: This new technique writes the summand, , as a Laplace transform. Then we can interchange the order of the summation and the integration with the proper justification. The result is an integral that can be computed and our sum is found. Also, sometimes we have a summand in the form of , and , where it is only convienient to write one as a Laplace transform. We will explain this technique and give several examples.

5:15—5:30 Friday **Session A—Room 207, Science Annex**

Christopher Swanson, Ashland University

Beware of Deranged Secret Santas Bearing Door Prizes

Abstract: A derangement is a permutation of objects that leaves no object in its original position. The author of this contributed paper recently encountered two problems related to derangements. Suppose n people attend an event that has k door prizes drawn by the attendees. What is the probability that no one draws his/her own name? When n = k, this is precisely the derangement problem. The second problem involves a "Secret Santa" gift exchange. The basic idea behind such an exchange is that the organizer "randomly" assigns each participant the name of another participant for whom to buy gifts. Since no one wants to buy gifts for herself, the organizer must find a derangement of the participants. If the same group of people participate for two consecutive years. what is the probability that no one buys gifts for the same person? The author will present a combinatorial analysis of the answers to these questions.

5:15—5:30 Friday **Session B—Room 208, Science Annex**

Mihai Caragiu, Ohio Northern University

What is a spooky slice from a Lucas number?

Abstract: If a hypothetical physical system consists of n sites arranged around a circle, with each site carrying a local variable (occupation number) that is either 0 or 1, subjected to the constraint that no two neighboring 1s are allowed, then the total number of configurations for this system is given by the n-th Lucas number. We will analyze the case in which the local variables of this system become entangled (as in the..."spooky action at a distance"!) and we will derive the corresponding... spooky slicing of the Lucas numbers!

10:30—10:45 Saturday **Room 207, Science Annex**

Khristo Boyadzhiev, Ohio Northern University

What are polylogarithms?

Abstract: This is a brief survey of polylogarithmic functions with some applications.

10:50—11:05 Saturday **Room 207, Science Annex**

Thomas Hern, Bowling Green State University

Searching for Madison College

Abstract: While we were collecting articles for the Ohio Masters of Mathematics project, a name popped up that we could not identify: Madison College. Where was it, and what was it? We eventually found it. Interesting information about the atmosphere surrounding the formation of schools and colleges in Ohio in the nineteenth century came to light. An article is now on the project page, which is accessible from the Section web page: www.maa.org/Ohio We also make the case for departmental history pages with examples.

11:10—11:25 Saturday **Room 207, Science Annex**

Nathan Baxter, Ohio Northern University

On the partial sums of the Harmonic series

Abstract: We investigate several number-theoretic properties of the partial sums of the harmonic series. Among them, we show that the n-th partial sum',with $n > 1$, can never be an r-th power ($r > 1$) of a rational number

Notes

Acknowledgements

The Ohio Section would like to thank the faculty and staff of the Mathematics Department at Ohio Northern University, as well as the members of the ONU Student Chapter of the MAA, for their efforts in hosting this meeting. Special thanks go to Harold Putt, 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.

Calendar of Coming Events

The spring meeting of the Ohio Section will be held at the University of Cincinnati on **March 26-27, 2004**. Featured speakers include

- Joe Gallian, University of Minnesota at Duluth
- Judy Holdener, Kenyon College
- Dale Mugler, University of Akron
- Dan McWhorter, National Security Agency

The Joint Mathematics Meetings will be in Phoenix, **January 7-10, 2004**. Registration deadlines are: October 31 (housing lottery), November 7 (for housing and mailing of program); December 12 (final deadline for reduced registration fee).

The Ohio Section Summer Short Course is scheduled for **June 2-4, 2004**, at Ohio Northern University. Colin Adams will present the course on Knot Theory. (For more information about Colin Adams, see his web site: http://www.williams.edu/Mathematics/cadams/ .)

Next fall, the Ohio Section meeting will be held at John Carroll University, in the new $66 million Dolan Center for Science and Technology. The dates are **October 22-23, 2004**.