

Chapter News

The Newsletter for Advisors of Student Chapters of the MAA

MathFest 2006

The Smoky Mountains



Students and faculty alike enjoyed a large number of activities at MathFest 2006 in Knoxville, TN. The student activities began with the student reception on Wednesday afternoon, followed by a very popular new event - Math Jeopardy. Student events continued with the MAA Student Lecture by Richard Tapia, the MAA Student Paper Sessions, the MAA Student Activities Session (formerly called the MAA Student Workshop) by James Tanton, the presentations of the MAA Mathematical Contest in Modeling winners, the Student Hospitality Center, and the Student Problem Solving Competition. In addition, students and advisors were also encouraged to enjoy the parallel Pi Mu Epsilon student paper sessions, the PME/MAA banquet, and the PME J. Sutherland Frame lecture. For details about all of these events, see inside!

Upcoming Events



Student Hospitality Center - open every day

Who Wants to Be A Mathematician - Friday 10 am

Undergraduate Reception - Friday 4 - 5 pm

AMS/MAA/SIAM Joint Session in Research by Undergraduates - Monday morning & afternoon

The Mathematics of Sudoku & Other Puzzles - Sunday 8 - 11 am

Publishing Undergraduate Research and Expository Articles - Sunday 9 - 10:30 am

MAA Student Lecture by Della Fenster - Sunday 1 - 2 pm

MAA Undergraduate Student Poster Session - Sunday 3:30 - 5:30 pm

Undergraduate Careers in Mathematics - Monday 9 - 10:20 am

For more details, see articles in this newsletter.



WEDNESDAY NIGHT AT MATHFEST

By Betty Mayfield, Hood College

Undergraduate student events at MathFest began with a bang this year, with two special activities planned on Wednesday evening before the opening banquet.

The Undergraduate Student Reception was sponsored jointly by CUSAC and Pi Mu Epsilon. A record crowd of students and their faculty supporters convened in a ballroom of the Hilton for light refreshments and conversation. Old friendships were renewed and new ones begun at this annual event. Tina Straley, Executive Director of the MAA, welcomed the students and reminded them of all the exciting student events planned for them at MathFest.

The first annual Math Jeopardy game was then played before an absolutely packed house, as teams of students answered questions about mathematics, and everyone in the audience feverishly (and silently) worked the problems along with them. (See the article below about Math Jeopardy.) This new event promises to become a MathFest staple, as participants and on-lookers alike were enthusiastic about its debut.

Many students also attended the Opening Banquet, which featured Art Benjamin in his role as mathematician. The opening banquet is a time for mingling with students and faculty from around the country, and the after-dinner talk is almost always light-hearted and accessible to undergraduates.

ANSWER: A FUN UNDERGRAD. MATHEMATICS CONTEST THAT LED OFF MATHFEST 2006

QUESTION: WHAT WAS MATHEMATICS JEOPARDY?

By John Harris, Furman University

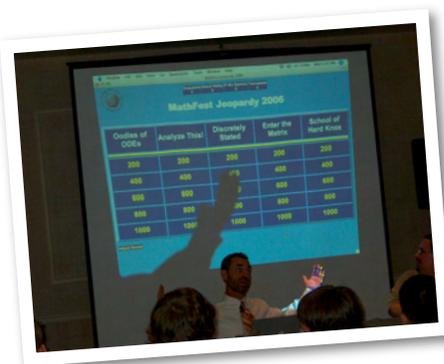
Four teams of students participated in a Mathematics Jeopardy demonstration on the first day of MathFest in Knoxville, Tennessee. A home team from the University of Tennessee, a team of Pi Mu Epsilon members, a team from Duquesne University and a team from the Grand Valley State REU treated a standing-room-only audience to an entertaining and challenging round of answers and questions. Topics covered included calculus, discrete mathematics, differential equations, linear algebra and mathematical miscellanea.

The participants from Pi Mu Epsilon were Tyler Drombosky (Youngstown State), Mark Krines (St. Norbert College), Hai X. Nguyen (UT-Knoxville) and Corby Usry III (Univ. of Mississippi). Team members from the Grand Valley State REU were Christy Hediger (Muhlenberg College), Brian Lerch (Grand Valley State), Jonah Leshin (Northwestern Univ.) and Daniel Schultheis (Univ. of Washington). The Duquesne students were Patrick Plunkett, Jeromy Sivek, Chase Smith and Jason Wood. And the members of the winning team from UT were Nick Boatman, Keith Langston and Josh Steadmon.

The contest, emceed by Mike Berry of UT and organized by Mike Mossinghoff of Davidson College and John Harris of Furman University, was a

demonstration of an event that has become a regular part of annual meetings of the MAA's Southeastern Section. It has been a great way to involve undergraduates in the sectional meetings. Over the past several years more than 30 schools in the Southeastern Section have participated, and for each of the past three years 64 students have attended the meeting as Jeopardy participants.

As the spectators saw at MathFest, the contest is challenging and the students are up to the task! If you would like more information on how you might create a similar contest for your student chapter or for your sectional meeting, feel free to contact Mike Mossinghoff (mimossinhoff@davidson.edu) or John Harris (john.harris@furman.edu).



MAA STUDENT LECTURE - RICHARD TAPIA

By Jacqueline Jensen, Sam Houston State University



Dr. Richard Tapia of Rice university gave this year's MAA Undergraduate Student Lecture. His topic was "Dr. Tapia's Math is Cool." He addressed two main topics in his presentation - Fair Lane Selection in BMX Racing, and Fusing Art and Mathematics Through Cars.

The first topic explored the exciting world of BMX racing. When competing in a BMX race, racing in Lane 3 is good luck, while racing in Lane 8 is bad luck. It is difficult to win out of Lane 8 be-

cause there is a longer distance to be covered and a biker in this lane is easily held outside. Dr. Tapia was then interested in a fair way to assign lanes so that in the three heats no racer would ever get assigned to Lane 8 in more than one race. This problem can be addressed by looking at triples of assignments, instead of assigning lanes race-by-race. In the end, Dr. Tapia was able to find a unique solution, due to using a weighted priority sum. This represents the fact that having a good lane in the third race is more beneficial than having a good lane in the first or second race. This was then published in the Houston Chronicle!

The second part of "Dr. Tapia's Math is Cool" was about the interaction of mathematics and art. Dr. Tapia wanted to use mathematics to create a psychedelic

video to be part of a car exhibit where he would be showing his vintage Chevrolet Chevelle. Created by a student of his, this video brought together his car, the feeling gotten from ads for muscle cars from the 1970s and Navier-Stokes differential equations to give a video which modeled fluid flow both inside and outside of images including cars and guitars.



STUDENT HOSPITALITY SUITE

By Richard Neal, American Society for the Communication of Mathematics



Hundreds of students and professors visited the Student Hospitality Center during this

year's MathFest. It remains the best place at the meetings for students to informally meet. Refreshments, mathematical puzzles, copies of Math Horizons, MathFest and PME t-shirts, brochures of student talks, information on giving talks at meetings, a spot to store things, and much more were made available to students. The accompanying picture shows an

advisor with his students, some of whom were giving talks on Thursday and Friday and competing in The US National Math Championships on Saturday. The Student Hospitality Center was located in the MathFest Exhibit Hall. In the background the email center is visible along with the MAA booth.



STUDENT ACTIVITIES SESSION - JAMES TANTON

By Lyn Miller, Slippery Rock University

The MAA Undergraduate Student Activities Session was led by James Tanton of St. Mark's Institute of Mathematics, St. Mark's School, in Southborough, Massachusetts.

Jim started by demonstrating the "math salute" of St. Marks, a fun little topological twister that had us in stitches, scratching our heads, and immediately engaged for what proved to be a delightful hour! His "Weird Multiplication And Weird Ways To Multiply" indeed covered a gamut of unusual algorithms and extensions of multiplication. Beginning with a crowd-pleasing lesson on using our fingers (and toes!) to multiply with a mod 5 flair, Jim shared the popular Elizabethan method (aka lattice multiplication) and Russian peasant algorithm with an eager audience who could hardly put our pencils down. A demonstration of the lattice method for multiplying polynomials capped off the "weird ways" to multiply.

Jim then led us to ponder the "what if?" types of questions that launch so much of mathematical exploration. His first style of "weird multiplication" was "intersection math": to compute the product of whole numbers a and b , draw a diagram consisting of one row of a dots, one row of b dots, and segments connecting each point from one row with each point of the other. The (maximum) number of points of intersection in this diagram defines the "intersection math" product of a and b . For instance, 4 times 3 in intersection math is 18. (Check it out for yourself!)

His next creative style of multiplication was "rectangle math": To compute the product of whole numbers a and b this time, draw a lattice of a rows of b dots each, then count the number of distinct rectangles that can be embedded in this lattice. For instance, 4 times 3 in rectangle math is 18. Quite an intriguing coincidence...

Jim's final style of weird multiplication was "dinner party math": Two groups of people are available to invite to a dinner party, and the host chooses two people from each group. The dinner party product of whole numbers a and b is the number of distinct party-guest combinations possible when one set of available guests has a members and the other has b . For instance, 4 times 3 in dinner party math is 18. Now he really had our attention!

"The great joy of math is finding the simple ways to explain things," Jim declared as he related these three types of "weird multiplication." I'll allow our readers to experience that joy themselves!

For more great ideas from Jim and the St. Mark's Institute of Mathematics, go to <http://www.stmarksschool.org/>.



DID YOU KNOW?

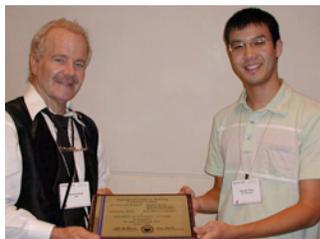


There is a guide to student activities to occur at the Joint Mathematics Meetings in 2007 online at http://www.ams.org/amsmtgs/2007_students.html



MATHEMATICAL CONTEST ON MODELING WINNERS

By Richard Neal, American Society for the Communication of Mathematics



Samuel Feng a Rice University student presented his team's MAA prize winning study, Wheel Chair Access at Airports, at the MCM 2006 award presentation during MathFest in Knoxville, Tennessee. In partnership with Toby Isaac and Nan Xio all of Rice University, the team entered the Discrete Problem Competition winning the MAA award. The group addressed the problem of finding an efficient way to position wheel-chairs to assist

handicapped passengers travel while taking into account the costs.

Asked the key to winning, Feng stated that it is important for the group not to waste too much time. In their early first meeting, the group divided up the tasks for the competition. The tasks were divided by who was most capable of which tasks. On a cautious note, Feng mentioned however that the computer simulations were done very early and had to be redone. Feng also noted during his presentation that it is probably more important for the students to be familiar with the range of math software packages that can be used to analyze the problem, rather than a particular area of mathematics.

The undergraduate mathematics that the group demonstrated was

impressive however. After studying layouts of representative airport terminals, they created adjacency graphs to depict all possible avenues of travel. They classified and plotted daily frequency of requests for wheel chairs and revised simulations taking into consideration reassigning chair travel at critical stages. The team ended up with a model that Feng described as robust, and capable of being implemented by many potential users. The advisor for the winning team was Mark Embree, CAAM Department at Rice. A plaque was sent to Dr. Embree at Rice. In the picture Samuel Feng is shown with Dr. Richard Neal who presented the plaque on behalf of the MAA.

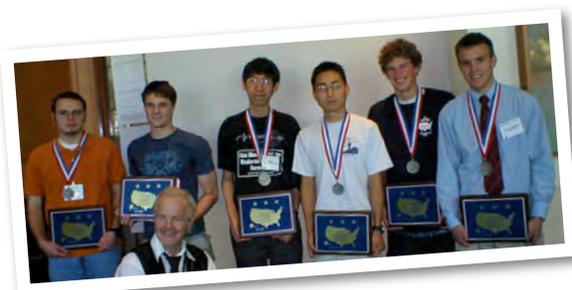
UNDERGRADUATE STUDENT PROBLEM SOLVING COMPETITION

By Richard Neal, American Society for the Communication of Mathematics

The finale of *The Problem Solving Competition*, The National Collegiate Math Championship, was held during MathFest in Knoxville, Saturday afternoon, August 12, 2006. During the year, hundreds of colleges and universities have mathematics problems posted on their campuses for undergraduates to attempt to solve. At the end of the year, a top problem solver is determined. These students are then invited to compete for the national championship at MathFest each year in August. This year six top place finishers were determined from the dozens of entries. The top place finishers received beautiful red, white, and blue plaques. The Mathematics Departments representing the students also received red, white, and blue engraved plaques with the names of the university, the chair, the advisor, and the student winner! All competitors received medals and t-shirts to acknowledge their efforts on their respective campuses. The students were asked to solve seven problems, which included a range of challenging undergraduate mathematics problems. Areas of linear algebra, combinatorics, integral and differential calculus, probability and statistics were represented in the problems. In addition, a couple of the problems were similar to

problems sent out during the year. If you would like to have your college or university included in *The Problem Solving Competition* free monthly mailing, contact Dr. Richard Neal, Editor, 1-800-229-1725 or rneal@asmath.org.

Below are pictured the first six place winners at the US National Collegiate Mathematics Championship at MathFest, along with Dr. Neal. From left to right they are George Alexander, 3rd Place, UNC Charlotte; Jordan Yoder, 5th Place, Goucher College; Jiaming Chen, 4th Place, St. Joseph's University; Jerry Xiang, 1st Place, Williams College; Daniel Walton, 6th Place, Harvey Mudd College; and Arturs Vrublevskis, 2nd Place, Colby College.



PME/MAA STUDENT BANQUET AND AWARDS SESSION



The annual PME/MAA Student Banquet and Awards Session was held from 6:15 - 7:45 p.m. in the Hilton Hotel on Friday, August 11. The room was packed with students, advisors, MAA/PME officers, and others interested in student activities. The banquet is an annual tradition and is held near the end of the meeting, after all the student projects have been judged. Doug Faires was recognized for his many years of service to Pi Mu Epsilon by being awarded the C.C. MacDuffee Award. See the following article for information about the student awards presented.

By Linda Braddy, East Central University

MATHFEST STUDENT PAPER PRESENTATIONS

By Ed Keppelmann, University of Nevada - Reno



It was another excellent summer for MathFest student presentations! On August 10th and 11th there were 60 presentations from 42 different schools with a huge variety of topics. Approximately \$5400 from the MAA was available to support travel for 17 students from around the country. The official winners are below but in many ways one could easily argue that nearly everyone was a winner. Some of the other topics that didn't receive official recognition included the following:

- A study of the Lights Out game in 2 and higher dimensions.
- The life and mathematics of Olga Alexandrova Ladyzhenskaya (1922-2004)
- A mathematical model of cancer cell growth.
- Weighted voting systems.
- Quantum computers and their calculations.

- Inductive solutions of the Pell-Equation.
- 7 talks which involved knots and links.
- The audible false tone produced by quartet singers.
- The connections between math and art and how each influences the other.
- A study of strategy for trivial pursuit.
- How information is decoded in DNA sequences.
- A introduction to hypergraphs.
- The Steiner problem on the cone and on projective space.
- A study of when guessing may be your best strategy.

Are you thinking about presenting for next year? Please do! Watch for application details in early March at <http://www.maa.org/students/undergrad/>

CUR (Council on Undergraduate Research) Award:

Sara Muhs, Augustana College, for Centers and Eccentricities of Finite Simple Graphs

Advisor - Thomas Bengtson

Abstract: We show how any graph can be extended so that a subgraph of the original graph is the center of the extension. We also consider the problem of adding an edge to a graph to minimize the sum of the eccentricities of the vertices of the graph.

Environmental SIGMAA Award:

Elizabeth Martin, University of Tennessee – Knoxville, for *Peopling of America with Logistic-Diffusion Simulations*

Advisor – Charles Collins

Abstract: A database containing information on the distribution of projectile points (arrowheads) for nearly every county in the contiguous United States, provinces in Canada, certain parts of Mexico, and Alaska was analyzed. This data produced a model for the spread of humans over North America. The model was built using a Logistic-Diffusion process on clusters of sites, each one with a system of neighboring clusters, and captures the qualitative dynamics of the system. The coefficients of the diffusion matrix are of specific interest as these values produce the possible paths of migration. Preliminary results are very promising both mathematically and archaeologically.

SIAM (Society for Industrial and Applied Mathematics) Award:

Daniel Walton, Harvey Mudd College, for *Optimal Resource Allocation to Deter a Terrorist*

Advisor – Susan Martonosi

Abstract: We present a game theoretic model of terrorist deterrence in which a defender must protect a single target from an attacker by investing in a security measure. We explore optimal resource allocation strategies for each player assuming the defender has only incomplete information about the attacker's preferences.

**MAA Student Chapter Awards:**

Lisa Byrne, St. Mary's College of Maryland, for *Magic Squares and Elliptic Curves*

Advisor – Susan Goldstine.

Abstract: Do the points of order dividing n on an elliptic curve form a magic square? Do the elements of $Z_n \times Z_n$ form a magic square? These two questions are equivalent, and this talk seeks to answer the second question in order to answer the first.

Patrick Plunkett, Duquesne University, for *Shaping Things Up: The Smallest Enclosing Ellipsoid of Random Knots*

Advisor – Eric Rawdon

Abstract: Random knots are commonly used as models for circular polymers. In order to better understand the physical properties of these polymers, a great deal of effort has been invested into understanding the size and shape of random knots. This talk will focus on measuring the shape of random knots using the smallest ellipsoid containing the knot. In particular, we focus on how the length and knotting of a random knot affect the size of the enclosing ellipsoid.

Christy Hediger, Muhlenberg College, and *Amanda Taylor*, University of Maine Farmington, for *San Gaku and Other Problems in Various Geometries*

Advisor – William Dickinson

Abstract: Japanese San Gaku problems are Euclidean geometry theorems colorfully inscribed on tablets and hung on shrines in ancient Japan as a form of worship. In this presentation, we explore how some of these theorems and others are transformed when reformulated in spherical and hyperbolic geometry. The basics of both geometries will be explained.

Caleb Astey, Duquesne University, for *Minimal Knots on 3-Dimensional Graph Paper*

Advisor – Eric Rawdon

Abstract: The cubic lattice, used as a model for thick molecular chains, can be thought of as a block of 3-dimensional graph paper. There are many generation schemes for random walks on this lattice. The most popular of these is the BFACF algorithm, which describes lattice moves that will alter a walk without changing its knot type. The lattice number of a knot type is the minimum number of edges necessary to create that knot. Though lattice numbers are hard to prove, using an adaptation of the aforementioned BFACF algorithm we generate minimal lattice knots, some of which improve upon previous work.

Gardner Marshall, University of Mary Washington, for *An Investigation of the Spin Groups*

Advisor - Randall Helmstutler

Abstract: We provide an overview of the machinery leading up to the existence of the spin groups as the universal covers of the special orthogonal groups. We will discuss both the topological and algebraic aspects, as well as their origins and applications.

Josh Zabl, Caltech, for *Properties of Random Restricted Minors*

Advisor - Anant Godbole

Abstract: For a probability $0 < p < 1$ and a graph G , a random restricted minor G' is obtained by selecting each edge of G and performing an edge contraction with probability p . The minor is "restricted" in the sense that unlike the usual graph minor, only edge contractions are allowed. The properties of taking a random restricted minor $G' \leq G$ are examined for random graphs as well as several standard classes of graphs.

Tobias Johnson, Yale University, for *Universal Cycles of Pebbling Configurations*

Advisor - Anant Godbole

Abstract: Consider all configurations of t

indistinguishable pebbles in n distinguishable buckets. For instance, when $t = 2$ and $n = 3$, we have the six pebbling configurations 11, 22, 33, 12, 13, and 23. We consider the six two-digit sequences contained in 112233, allowing the sequence to wrap around at the end; these six sequences are exactly the above configurations. We call such strings universal cycles and establish criteria for when they exist.

Rachel Whitaker, University of Georgia, for *A Tangled Topic: The Connected Sum of Mathematical Knots*

Advisor - Jason Parsley

Abstract: Through developing computer programs and exploiting knot symmetry, we created a library of composite knots by connected summing the prime knots already well-known. By tightening knots to their minimum ropelength configuration we hope to demonstrate the correlation of ropelength to the behavior of a subatomic particle, the glueball.

Connor Quinn, Williams College, for *Nonflat Surfaces with Zero Gauss Curvature (!)*

Advisor - Frank Morgan

Abstract: In the enlarged category of surfaces with density, there are non-Euclidean surfaces with generalized Gauss curvature 0. I'll discuss an interesting example.





Events at the 2007 JMM held January 5 - 8

UNDERGRADUATE POSTER SESSION

By Diana Thomas, Montclair State University

This year's Joint Meetings Undergraduate Student Poster Session will be held on Sunday January 6, 2007 from 3:30 - 5:30 p.m.

Abstract submission by students began on August 1, 2006 with a deadline of November 1, 2006. Abstracts are to be submitted electronically at <http://www.maa.org/students/undergrad/poster07.html>. Last year there were over 120 poster presentations and we expect similar numbers this year. The session tends to fill quickly so we encourage interested students to apply early.

Posters are judged by 3 mathematicians for content, style and answers to questions. We are always in need of judges for the competition. Interested faculty can register their information at <http://www.maa.org/students/undergrad/judges.html>. We appreciate all volunteer judges' input and time. We are looking forward to a wonderful session again this year. Hope to see everyone in New Orleans!

PANEL DISCUSSION FOR UNDERGRADUATE ACTIVITIES

By Kay Somers, Moravian College

The Committee on Undergraduate Student Activities and Chapters (CUSAC) is sponsoring a panel discussion at the JMM, on *Engaging Students in Research, Clubs, Student Chapters, and Internships*. The panelists' discussion will focus on ways in which we can engage students in a variety of learning activities outside the usual classroom experiences.

The four speakers will share their experiences and describe activities that allow students to gain valuable mathematics-related research and work experience, communicate mathematics, build community among their peers, and have fun. These activities include independent and group research experiences, student conferences, and MAA Student Chapter events. In addition, panelists will discuss internships, field study projects, and

service projects. Panelists include **Gary Gordon**, Lafayette College; **Deanna Haunsperger**, Carleton College; **Angela Spalsbury**, Youngstown State University; and **Richard Zang**, University of New Hampshire. Look for the panel (organized by **Kay Somers**, Moravian College and **Judy Sorenson**, Augsburg College) on Saturday, 1:00 p.m. - 2:20 p.m.





HOW TO REACH THE MAA

For Membership Information, Subscriptions, and Publication Orders contact:



The MAA Service Center
P.O. Box 9112
Washington, DC 20090-1622
800-331-1522 or (301)617-9415
FAX: (301) 206-9789

For the MAA Headquarters:

The Mathematical Association of America
1529 Eighteenth Street, NW
Washington, DC 20036-1385
800-741-9415 or (202) 387-5200
FAX: (202) 265-2384

*Suggestions, concerns, and/or contributions of articles for the CUSAC newsletter may be sent to the
Chapter Newsletter Editor:*

Jacqueline Jensen
Dept of Mathematics and Statistics
Sam Houston State University
Box 2206
Huntsville, TX 77341-2206
(936) 294-3517
jensen@shsu.edu