

Department of Mathematical Sciences Newsletter

Students Win Top Prize at the Joint Meetings

Congratulations to math major **Luba Lidman** and physics major **Marie McCrary**, this year's winners of the MAA-Sponsored National Undergraduate Student Poster Session in Mathematics at the 2005 AMS-MAA Joint Meeting in Atlanta, GA! Both students were awarded a top prize of one hundred dollars. Their successes continue a tradition of excellence for Montclair State University in this competition (**Steven Lettieri** won at last year's meeting).

The MAA-Sponsored National Undergraduate Student Poster Session in Mathematics is held every year at the Joint Meeting. Undergraduate students from universities and 4-year colleges around the nation submit posters presenting their research. Schools participating in this year's competition included Cornell, MIT, Princeton, University of Chicago, UC Berkeley, Texas A&M, Wake Forest, and many more. The posters are then judged by three mathematicians on mathematical content, answers to questions, and poster design. Based on the judges' numerical assessment, the top-rated posters receive a \$100 prize.

Luba presented her research on the algebraic dynamics of a one-parameter class of maps. Her faculty advisor is **Dr. Diana Thomas**. Marie

presented her work on the bifurcations in multi-strain disease dynamics. Marie's faculty advisor is **Dr. Lora Billings**.

Also attending the AMS-MAA Atlanta meeting was math major **Maggie Viz**. She gave a talk on Saturday afternoon based on her research with **Dr. Lora Billings**.



Figure 2. Luba Lidman and Marie McCrary celebrate their shared success as winners of the MAA-Sponsored National Undergraduate Student Poster Session in Mathematics.

Welcome New Faculty

We welcome **Dr. Aihua Li** as a new Associate Professor in Mathematics. Dr. Li taught for nine years at Loyola University New Orleans before joining MSU. Dr. Li earned her PhD from the University of Nebraska-Lincoln in 1994; her dissertation and initial research focused on commutative algebra with a concentration on structures of commutative Noetherian rings and prime ideals.



Recently, she has become more interested in algebraic applications to discrete dynamical systems. She has supervised several undergraduate research papers and one of them won a Mathematical Association of America sectional meeting student paper competition. Currently two MSU undergraduate students, **Bilal Abadi** and **Robert Alexander Prince**, are working with her on projects. Bilal is modeling a roller coaster track and Robert is working on a discrete time series problem.

Faculty Activities at the Joint Meetings

Montclair State University's Department of Mathematical Sciences had a strong presence at the Joint Meetings of the American Mathematical Society and the Mathematical Association of America in January 2005. Several faculty activities are described below.

Dr. Lora Billings presented some of the latest student activities she has designed for our Differential Equations course in a talk titled "Projects in population dynamics."

Dr. Youngna Choi presented a talk in the MAA special session on My Three Favorite Original Calculus Problems. This is a joint work with **Dr. Kimberly Burch**, titled "When a paddle wheel spins".

Dr. Michael Jones spoke in the AMS-SIAM Special Session on Dynamics of Integer Sequences and Rational Maps. The title of his talk was Dynamics of Nim Induced Difference Equations. This is a joint paper with **Dr. Diana Thomas**.

Dr. Patricia Kenshaft presided as chair at the last panel of the Committee on Mathematics and the Environment. The panel discussed various ways in which mathematicians could reach out to society.

Dr. Mark Korlie presented his work on "A 3-D Molecular Mechanics Simulation of Cracks and Fractures in a Solid under Stress".

Dr. Diana Thomas co-organized an AMS special session on the Dynamics of Integer Sequences and Rational Maps with Dr. Marc Chamberland of Grinnell College. Some notable speakers included Michal Misiurewicz, Jeff Lagarias, Jon Borwein, David Bailey and **Michael Jones**. Dr. Thomas also assisted with the coordination of the MAA sponsored Undergraduate Research Posters Session.

Several departmental members were judges for the competition, including **Drs. Lora Billings, Youngna Choi, Michael Jones, Mark Korlie, and Aihua Li**.

Mathematics Seminar

On September 9, **Dr. Mike Puls** from Eastern Oregon University presented at the departmental seminar on the vanishing and non-vanishing of the first L^p -cohomology space of some finitely generated groups, titled "The First L^p -cohomology and group cohomology of finitely generated groups" The talk was well attended by majors and faculty.

Dr. Ethan Coven from Wesleyan University gave a talk on November 4. The title of his talk was "The dynamics of one dimensional cellular automata: shift register sequences, inter alia". He spoke about the topological property of cellular automata, such as topologically transitivity, dense periodic points and topological entropies.

The talk by **Dr. Paul Atela** from Smith College on Nov 18 was titled "A Dynamical Systems Model in Phyllotaxis" and was about Fibonacci numbers that can be found in the spiral arrangements of natural objects such as

pineapples, artichokes, marguerite flowers, asparagus and pinecones. Dr. Atela talked about this phenomenon and presented a Dynamical Systems model for plant growth.

Dr. Richard S. Falk from the Department of Mathematics at Rutgers University gave the CSAM Mathematics seminar. His presentation titled "Approximation by Piecewise Polynomials and Applications" gave a survey on the approximation of functions by polynomials and piecewise polynomials.

Kudos to the Seminar Committee Youngna Choi, Baojun Song, and Diana Thomas. Those who are interested in the seminar, please contact the Seminar Committee Members **Drs. Youngna Choi** (choiy@mail.montclair.edu), **Baojun Song** (songb@mail.montclair.edu) and **Diana Thomas** (thomasdia@mail.montclair.edu) for additional information.

Math Ed SIG hits Conference

Several faculty members and students of the Mathematics Education SIG presented their ideas at the 17th Annual Conference of the Association of Mathematics Teachers of New Jersey. The conference title was "Challenging Ourselves and Our Students" and was held on October 14th and 15th in Somerset. The following presentations were given:

Dr. Evan Maletsky "Assorted Breakfast Treats"

Dr. Ken Wolff "Six Classic Problems That Will Increase Your Students Understanding And Achievement In Mathematics" and "Finally Understanding $y = A \sin(2F(x + P)) + V$ "

Dr. Tony Piccolino "Manipulatives In Middle School"

Dr. Mika Munakata "Chance And Statistical Thinking For Middle Grades"

Diane Carluccio (Ed.D. student) "Algebra I, Graphing Calculators, And Inclusive Classrooms: Explore the Possibilities"

LeeAnn Gennett (MS student)
"Transformations in the Coordinate Plane Using Geometry's Sketchpad".



Figure 1. Doing the wave. Kohnie Tingley demonstrates the sine wave as Ron Efron and Danielle Amato push her on a skate-board. Students participated in trigonometry activities demonstration for MATH 579, Approaching School Mathematics Through Applications.

Reconnect Satellite Conference at MSU

The Reconnect Satellite Conference 2005 will be held at Montclair State University on June 12 - June 18, 2005. The Mathematics of Elections and Decisions will be the theme of this conference. The principal lecturer will be **Donald G. Saari**, from the Institute for Mathematical Behavioral Sciences, Department of Mathematics and Economics, University of California, Irvine. **Michael A. Jones**, from Montclair State University, will be the guest lecturer. The organizers of this conference are **Arup Mukherjee**, from Montclair State University, and **Fred S. Roberts**, from Rutgers University. More information is available at <http://dimacs.rutgers.edu/reconnect/Montclair/>.

This conference exposes faculty teaching undergraduates to the mathematical sciences research enterprise by introducing them to a current research topic relevant to the classroom through a series of lectures by a leading expert and involving them in writing materials useful in the classroom. Participants have the possibility

of following up by preparing these materials for publication in the DIMACS Educational Modules Series.

The workshop offers the opportunity for junior faculty as well as mid-level and senior faculty to advance to research questions in a new area of the mathematical sciences. Participants will also acquire materials and gain ideas for seminar presentations and for undergraduate research projects.

This conference is also aimed at reconnecting faculty to the mathematical sciences research enterprise by involving them in a leading research center which is a consortium of Princeton University, Rutgers University, AT&T Labs, Bell Labs/Lucent Technologies, NEC Research and Telcordia Technologies. There will be opportunities to follow up after the conference by getting connected to DIMACS researchers and other DIMACS programs throughout the year.

Student Achievements

Kei Kaneko defended his master's thesis on combinatorial game theory ("On the P/N Sequence Structure of Nim") under **Dr. Michael Jones** in August 2004. Kei's thesis was the first Pure and Applied Mathematics masters thesis accepted. Kei was also an undergraduate mathematics and computer science double major and published a paper on his research with Professor Jones and another undergraduate student, **Jae Gyun Cheong**. Kei is now

attending the Ph.D. program in mathematics at the New Jersey Institute of Technology.

Five mathematics major students, **Melinda McHale, Victoria Meo, Mike Poko, Patrick Vogel** and **Christopher Weldin** graduated in January 2005. Christopher is pursuing an MS degree in Mathematics at MSU, Mike started his graduate work at Stevens Institute of Technology and Victoria is working in real estate. Congratulations to all of them!

Department of Mathematical Sciences offers New Courses

MATH 280, *Exploring Using Models* In 2003, **Drs. Michael Jones** and **Arup Mukherjee** were awarded a National Science Foundation Course Curriculum and Laboratory Improvement (NSF CC&LI) grant to develop a course which explored the use of models. This course was designed to assist majors in the transition to the upper-level pure mathematics courses by exposing them to simple proof-writing techniques such as induction, contradiction, and logical expansion as they develop applied models. In addition, this course exposes students to applications of mathematics to other scientific disciplines in an exploratory fashion. It also provides students with the opportunity to take a course primarily consisting of majors prior to their third year in the program. Hopefully, this experience will allow students to bond and solidify their decision to major in mathematics while exposing students to many important aspects of mathematics.

This spring, the course, entitled ***Exploring Using Models***, is being co-taught by Drs. Mukherjee and Jones. This was first run as an experimental course in Spring 2004 as **MATH 190**. Professors

Jones and Mukherjee are in the process of revising the course and changing its number to **MATH 280**. As a result of this course's success, all math majors will be required to take this course. For further information, contact Dr. Jones (jonesm@mail.montclair.edu) or Dr. Mukherjee (mukherjeea@mail.montclair.edu).

MATH 466/467, *Mathematics of Finance I&II* Two new courses, **MATH 466 (Mathematics of Finance I)** and **MATH 467 (Mathematics of Finance II)**, have been deployed. Mathematics majors can take these courses as mathematics electives. **Dr. Youngna Choi**, the developer of both courses, taught MATH 466 for the first time in the Fall 2004 semester. MATH 467 is being taught this semester.

MATH 466 is devoted to the mathematical theory of interest, annuities and Capital Asset Pricing Method. **MATH 467** covers the mathematical analysis of financial derivatives such as options, futures as well as fixed income securities. The prerequisite for MATH 466 is MATH 340. For further information, contact Dr. Youngna Choi (choiy@mail.montclair.edu).

Faculty Activities and Publications

Dr. Lora Billings had two articles appear, "Dynamical epidemic suppression using stochastic prediction and control," (with I.B. Schwartz and E.M. Bollt) in *Physical Review E* 70, 046220 (2004) and "Stochastic bifurcation in a driven laser system: Experiment and theory," (with I.B. Schwartz, D.S. Morgan, E.M. Bollt, R. Meucci, and E. Allaria) in *Physical Review E* 70 026220 (2004).

Dr. Kimberly Burch had the article "Melting Point Models of Alkanes" published in the *Journal of Chemical and Engineering Data* [49, (2004) 858-863]. This is joint work with Dr. Glen Whitehead of the University of Pittsburgh.

Dr. Youngna Choi had two articles appear, "Attractors from One Dimensional Lorenz-like Maps" in *Discrete and Continuous Dynamical Systems*, V11, n2&3 (September & October 2004), 715-730 and "Compensating Balance: a comment" (with Y. Yoon) in *The International Journal of Banking and Finance*, Volume 2, No. 1, 2004. She also spoke at the weekly Dynamical Systems Seminar at Northwestern University in January 2005.

Dr. Michael Jones published "Win, Lose, or Draw: A Markov Chain Analysis of the National Football League's Overtime Rules" in the *College Mathematics Journal* [V35, n5 (Nov. 2004), 330-336]. He also published "Reputation, Compliance, and Development" with G.W. Downs, Chapter 5, p. 117-133, in *The Impact of International Law on International Cooperation: Theoretical Perspectives*. (Ed. by Eyal Benvenisti and Moshe Hirsch), Cambridge University Press, September 2004. Dr. Jones also gave a talk entitled "Dynamics of Nim Induced Difference Equations" at Clarkson University on January 13, 2005 in their colloquium

Dr. Pat Kenschaft gave a talk about women in mathematics on Friday, December 3, 2004 at Marymount College, Fordham University, in Tarrytown, New York titled, "Righting the Angle: Improving Mathematics, Science, and Technology Education for Girls and Women in K-12." Her article "Racial Equity Requires Teaching Elementary School Teachers More Mathematics" appeared on pages 208-212 of the

February, 2005, issue of the *NOTICES* of the American Mathematical Society.

Dr. Aihua Li had the article "Symbolic Powers of Radical Ideals," (with Irena Swanson) accepted for publication in the *Rocky Mountain Journal of Mathematics*. She has also refereed three research articles for the following journals: *Linear Algebra & its Applications*, *International Journal of Mathematics & Mathematical Sciences*, and *Mathematics and Computer Education*.

Dr. Evan Maletsky had a busy speaking schedule this fall semester, giving five different addresses across the country. In October, he spoke at the Northwest Mathematics Conference in Spokane, WA, on the topic, From Frogs to Fractals, and at the Association of Teachers of Mathematics of New England in Providence, RI, on classroom paper-folding activities using circles. He also gave a breakfast address at the Association of Mathematics Teachers of New Jersey titled Assorted Breakfast Treats. In November, Dr. Maletsky spoke at two regional meetings of NCTM in New Orleans, LA, and Minneapolis, MN, on Problems and Puzzles that Stretch the Mind and the Imagination and Math Activities Using Frogs as a Theme. Last spring and summer he gave addresses at the NCTM annual meeting in Philadelphia, PA and at the Conference for the Advancement of Mathematics Teaching in San Antonio, TX.

Dr. Arup Mukherjee had the article, "Shear flow in nematic liquid crystals: Freedericksz transition as a bifurcation" accepted for publication in *Physical Review E*. Also accepted for publication in *The International Journal of Heat and Mass Transfer* was the article "Heat transport in Stokes' problem with melting: a two-layer approach" (coauthored with **Dr. John G. Stevens**).

Drs. Diana Thomas and John Stevens and former undergraduate math/physics major **Steven Littieri** had their article "Characteristic and Minimal Polynomials of Linear Cellular Automata" accepted by *The Rocky Mountain Journal of Mathematics*. Steven Littieri is currently pursuing a PhD in physics at Lehigh University.

Serving New Jersey: NJ-NExT

Three faculty members, **Drs. Kimberly Burch, Youngna Choi, and Aihua Li** were accepted as 2004 NJ-NExT (New Experiences in Teaching) Fellows. The New Jersey section of the Mathematical Association of America (MAA) created NJ-NExT as a local chapter of the national Project NExT program. Project NExT, sponsored by the MAA and funded by the Exxon Education Foundation, is a program designed to introduce new or recent Ph.D.s in the mathematical sciences teaching at universities throughout the United States to the broad range of roles that face a new faculty member. Particular attention is spent on finding ways to improve the teaching and learning of undergraduate mathematics. NJ-NExT is run on a smaller scale but has the same goals as Project NExT.

The first event for the Fellows was a workshop held in conjunction with the MAA-NJ section

meeting at The College of New Jersey on November 12-13, 2004. At this workshop, Fellows explored and discussed issues of special relevance to beginning faculty, such as: balancing teaching, research, and institutional service responsibilities, getting students active during lectures, making effective use of technology, assessing student learning (tests and other techniques), and finding and making effective use of good supplementary materials.

After the workshop and continuing throughout the academic year, Fellows will participate in: a mentoring program, which pairs each NJ-NExT Fellow with a mentor, an experienced faculty member at a similar institution in the state; an electronic network that links NJ-NExT Fellows with one another and with distinguished teachers of mathematics; and a short workshop at both the spring and fall section meetings.
