

Department of Mathematical Sciences Newsletter

Fall 2003

MSU's first doctoral graduates (Article from Insight 9/8/03)



Ken Wolff (left) and Evan Maletsky (second from right) chaired the dissertation committees for Montclair State's first students to complete a doctoral program, Martha Baklarz Croley (second from left) and Deborah Ives.

Martha Baklarz Croley and Deborah Ives made history this summer when they became the first Montclair State students to earn a doctoral degree. Both public school teachers earned a doctor of education (Ed.D.) in pedagogy with a specialization in mathematics education. The University also offers an Ed.D. with a specialization in philosophy for children.

Montclair State gained approval for its first doctoral program in 1998 and a class of 16 students began study in the summer of 1999. Croley and Ives are the first to complete the program, successfully defending their dissertations in July.

"This is a significant accomplishment for the University and for these two students as they completed their program in four years while continuing to work as teachers in the public schools," said Montclair State President Susan A. Cole.

Ives, a mathematics supervisor in West Milford, presented "The Development of Seventh Graders' Conceptual Understanding of Geometry

and Spatial Visualization Abilities Using Mathematical Representations with Dynamic Models." The study explored the role of representations in mathematical learning and their relationship to students' conceptual understanding of geometry and measurement.

With many students in grade seven encountering difficulties making translations from external representations to internal abstract structures, this study sheds light on how the process occurs, specifically as it relates to cognitive building blocks in the area of internal representations, providing results that have implications for curriculum design and practice.

Evan Maletsky '53 '54 M.A. of Mathematical Sciences and Montclair State's most senior faculty member, chaired Ives' dissertation committee. Others on the committee were retired Montclair State mathematics professor Max Sobel, Tamara Lucas of Educational Foundations and James Fey from the University of Maryland.

"Deb's study adds to the research available on the critical role the middle school grades play in the students' development of thinking skills in mathematics," Maletsky said. "Furthermore, it focuses on the key topics of geometry and measurement, two content areas where assessment has indicated a great need for improvement."

Maletsky said a unique component of Ives' research was the preparation of three creative, one-week units incorporating activities involving the dynamics of change, which served as the basis for her analysis. "This material will be valuable for both students and teachers, especially those needing to develop better spatial visualization skills," he said. "We plan to use these activities and this research in the geometry course that is part of our current workforce grant project for middle school mathematics teachers."

MSU's first doctoral graduates (continued)

Croley, a mathematics teacher and team leader at Bloomfield Middle School, successfully defended her dissertation, "Factors That Produce and Reduce Mathematics Anxiety as Perceived by Seventh-Grade Females." Data for the qualitative study was based on a series of interviews with 25 seventh-grade females whose scores on the MARS survey indicated they had above-average mathematics anxiety. The students participated in three in-depth group interviews and reported the most influential factors for both producing and reducing mathematics anxiety as teachers, behavior of classmates, pace and extent of mathematics curriculum, and parents and siblings.

The study documented the significant effect that teachers have on both producing and reducing mathematics anxiety. It also contained concrete suggestions for teachers to use that could reduce anxiety in their students.

"Mathematics anxiety corresponds to lower levels of mathematics achievement and is considered a major reason many females decide not to pursue further study or careers in quantitative disciplines," said Kenneth Wolff '63 of Mathematical Sciences, who chaired Croley's dissertation committee. Other members were department colleague Anthony Piccolino, Juan Miguel Fernandez-Balboa of Curriculum and Teaching, and John Dossey from Illinois State University.

"While other researchers have interviewed math-anxious females, those studies usually involved university students," Wolff said. "Martha's study is significant because it addresses math-anxious females at a critical age and grade level, when students often decide what careers and academic areas they will pursue," Wolff said. "Some of the students' suggestions for reducing mathematics anxiety were surprisingly perceptive."

New Courses in Financial and Actuarial Mathematics

Two new courses, Mathematics of Finance I and II (Math 466 and 467, respectively), will be officially launched in Fall 2004. Developed by **Dr. Youngna Choi**, these two courses and several other courses from various departments form a core part of the new program under development, Mathematics Major with a concentration in Financial Mathematics. Math 466 and 467 will cover the basic mathematics currently used in the financial industry, including interest theory, security pricing and portfolio selection. Please talk to Dr. Choi if you have any questions about this exciting new program.

In other financial and actuarial math news, Dr. Choi also has continued to lead a seminar designed for students who are preparing to take Examination Course 1 offered by the Society of Actuaries (SOA). This semester, she worked with three students and one of them took the Course 1 Examination in November. This seminar will be offered every semester for the May and November examinations. The new Mathematics of Finance course can be used to prepare for the Examination Course 2 by the SOA.

Fall 2003 CSAM Seminar in Mathematical Science

This semester, two people gave talks in the CSAM Seminar in Mathematical Science Series. **Professor Steven J. Brams** of New York University, spoke on September 18, 2003. The title of his talk was "Is There a Better Way to Elect a President?" He applied voting theory to explain the principles and structure behind

political elections. **Dr. Dhammika Amaratunga**, a Senior Research Fellow in Nonclinical Biostatistics of Johnson & Johnson Pharmaceutical Research & Development, spoke on October 23, 2003. The title of his talk was "Exploration and Analysis of DNA Microarray Data".

Master's in Mathematics soon to be awarded

The first Mathematics Education Master's Thesis is nearing completion. Thesis director **Dr. Gideon Weinstein** and committee members **Drs. Ken Wolff** and **Mika Munakata** anticipate the Spring 2004 completion of **Jodie Sovak's** thesis, titled "Mathematical Sophistication and Educational Philosophies Among Prospective and Practicing Mathematics Teachers."

Ms. Sovak has been interviewing teachers and pre-service teachers about their mathematical knowledge, probing for the deep and conceptual knowledge that is so important to helping

schoolchildren achieve the kind of mathematical understanding described in the NCTM Standards. Her work also investigates connections between the teachers' understanding of mathematics and their teaching philosophies; previous research suggests that a naive understanding of mathematics results in rigid and repressive ideas about how and why mathematics should be taught, while a more sophisticated understanding results in a more humanistic, progressive, and socially relevant teaching philosophy.

Update on the Department Seminar

Our departmental seminar series continued this semester thanks to co-organizers **Dr. Michael Jones**, **Dr. Arup Mukherjee**, and **Dr. Diana Thomas**. Brian Hopkins at Saint Peter's College gave a talk on coloring numbers. For example, one blue, two red... How far can you go coloring the positive integers, so that all solutions to $x + y = z$ are multicolored? It was proved in early 20th century that for any fixed number of colors, you can only go so far before there has to be a "monochromatic solution," no matter the color assignments. This result yielded another research branch called Rado number of an

equation. The 2-color Rado numbers are known for a growing number of families of linear equations. Professor Hopkins outlined the field and gave a sketch on a new result.

We expect to have a more active schedule in the Spring 2004 semester. Watch the bulletin boards and our department web page for the upcoming schedule. If you have any suggestions for future speakers or topics, please contact one of the co-organizers. Most talks are geared towards students, so majors are encouraged to attend.

Student Achievements

At the 16th Annual Two-Day Conference of the Association of Mathematics Teachers of New Jersey, **Sharon Leathers**, **Helene Prevosti** and **Jodie Sovak** presented a paper titled "Motivating Meaningful Understanding in the Middle School Math Classroom." **Michael Dixon** and **Nykita Thompson** presented "Patterns & Problem Solving = Student Progress." Jodie is a graduate assistant in our department. Sharon, Helene, Michael and Nykita are graduate students participating in the Middle Grades Math and Science Teacher Enhancement Program.

Steven Lettieri attended the Fall Midwest Dynamical Systems Seminar in Indianapolis, IN, in October. He is also competing in the CUPM poster competition at the Joint Meetings in Phoenix in January. He will be presenting his work on a recently submitted paper "Characteristic and Minimal Polynomials of Linear Cellular Automata" (with Dr. John Stevens and Dr. Diana Thomas). If you are attending the meetings be sure to stop by and support his efforts. The poster session will take place on Friday, January 9 from 4:00 to 7:00 pm.

Faculty Activities

Dr. Diana Thomas had the following papers accepted: "A Mathematical Evolution Model for the Phyto-remediation of Metals" (with MSU student Lynn Vandemuelebroeke and Ken Yamaguchi) to appear in *Discrete and Continuous Dynamical Systems*, "The N-Number Ducci Game-Open Problems and Conjectures" (with Marc Chamberland) to appear in *Journal of Difference Equations and Applications* and "Controlling Wound Healing Through Debridement" (with **Michael A. Jones** and **Baojun Song**) to appear in *Mathematical and Computer Modeling*. **Dr. Thomas** also presented an invited talk at the Los Alamos National Labs and was the plenary speaker at the Mathematics Association of Two Year Colleges-NJ Fall meeting.

Dr. Lora Billings had the article "Controlled and sustained chaos in a driven laser," (with R. Meucci, D. Cinotti, E. Allaria, I. Triandaf, D. Morgan, and I.B. Schwartz) accepted to *Physica D*. She also wrote a chapter "Chemical and biological sensing -- Modeling and analysis from the real world," (with I.B. Schwartz, D. Holtt, A. Kusterbeck, and I. Triandaf) to appear in the book "Mathematical and Modeling Approaches in Homeland Security," published in the SIAM's series Frontiers in Applied Mathematics, co-edited by Tom Banks and Carlos Castillo-Chavez.

Dr. Pat Kenschaft gave two talks at Middlebury College, VT. She gave one well-attended public talk titled "Mathematics for Human Survival". Her second talk was to the class that is using her text "Mathematics for Human Survival". She spoke about the issues involved and how to become active. At the annual AMS/MAA **Dr. Kenschaft** will be leading a panel comprised of

authors of the book *Environmental Mathematics* that was published by the MAA in 2003, co-edited by Ben Fusaro and **Pat Kenschaft**. She will also be chair the meeting of the Committee on Mathematics and the Environment.

Dr. Youngna Choi had the paper "Attractors from One-Dimensional Loren-like Maps" accepted by *Discrete and Continuous Dynamical Systems*.

Dr. Michael Jones was recently named to the Editorial Advisory Board of the Mathematical Association of America's The College Mathematics Journal. Recently he was named the Public Information Office for the NJ section of the MAA. **Dr. Jones** also had the following papers appear: "Partitioning Triangular Numbers" (with M.J. Haines), *College Mathematics Journal*, V34, n4, (Sep. 2003), 295. "Dynamic Models of Coalition Formation: Fallback vs. Build-Up" (with S. Brams and D.M. Kilgour), *Proceedings of the Ninth TARK (Theoretical Aspects of Rationality and Knowledge) Conference*, edited by M. Tennenholtz, (June 2003) 187-200.

Dr. John Stevens had the paper (co-authored with Prof. Barat and Dr. Slanvetpan of NJIT, "Process control of a laboratory combustor using artificial neural networks" appear in *Computers & Chemical Engineering* (2003, 27, 1605-1616). His work with Prof. Barat and Prof. Donna J. Cedio-Fengya of William Paterson University, "A Maximum Mixedness Stirred Reactor Model with Specifiable Degrees of Thermal Mixing." was presented at the Eastern States Technical Meeting of the Combustion Institute, October 2003, and published in its proceedings.



Math Pizza Party

A pizza party was held on Nov. 6 to give our incoming freshman majors the opportunity to socialize with faculty and to contemplate the mathematical and physical characteristics of a pizza pie. A wonderful time was had by all.

MSU is Active at Conferences

16th Annual Conference of the Association of Mathematics Teachers of New Jersey

When the Association of Mathematics Teachers of New Jersey held its Sixteenth Annual Conference at the East Brunswick Hilton on October 23-24 the Department of Mathematical Sciences was well represented. Two faculty members and five graduate students (see Student Achievements) presented at conference sessions and four other faculty spent time at a department booth in the exhibit area answering questions about our graduate programs.

Dr. Tony Piccolino and **Dr. Ken Wolff** presented papers titled Data Analysis for Middle School, Activities for grades 6-8 and Thinking Recursively in Grades 5-8, respectively. The department sponsored an information table for the entire two days of the conference. Many conference attendees stopped and asked questions about our programs or just to visit with faculty from their alma mater. **Drs. Eileen Fernandez, Karen Ivy, Mika Munakata, Tony Piccolino, Gideon Weinstein, Dr. Ken Wolff,** and **Ms. Jodie Sovak** devoted their time and effort at this public relations and recruitment outreach by the department

Joint Meetings of the AMS and MAA

During the first weekend of January each year, many mathematicians from all over the world gather together for the annual national Joint Meetings of the American Mathematical Society (AMS) and Mathematical Association of America (MAA). Historically, this meeting has played a crucial role in the field of mathematics in terms of various aspects not only restricted to academic presentations and employment. This

year the meeting will be held in Phoenix, AZ and quite a few members of the department will make presentations. The following faculty will make presentations titled:

- **Kimberly Burch** Applied Graph Theory in the Classroom
- **Youngna Choi** Safety Deposit: what it really costs us
- **Karen Ivy** the issue of writing in mathematics.
- **Michael Jones** Whether You Win or Lose, It's How the Overtime is Played: A Markov Chain Analysis of the National Football League's Overtime Rules
- **Michael Jones** (with S.J. Brams and D.M. Kilgour) Forming Stable Coalitions from Preferences over Coalition Partners,
- **Diana Thomas** From Wound Healing to the West Nile Virus: Time Scale Applications.

In addition, **Drs. Diana Thomas, Kimberly Burch,** and **Youngna Choi** will be judging the undergraduate poster competition. **Dr. Michael Jones** will present a poster on his National Science Foundation grant with **Dr. Arup Mukherjee** and participate in a panel discussion organized by Project NExT on increasing student participation in extra-curricular events.

The Department is recruiting an Assistant Professor, on a tenure-track line, to start in the Fall '04 semester. In particular, we are interested in someone who has expertise in discrete applied mathematics. The Search Committee includes **Drs. Diana Thomas, Mark Korlie, Arup Mukherjee,** and **Michael Jones.** **Drs. Jones, Roberts** and **Thomas** will be attending the meetings and hope to meet prospective candidates.
