

Department of Mathematical Sciences Newsletter

Spring 2004

New Course Announcement: Mathematics of Finance I & II

Headed by **Dr. Youngna Choi**, the Department of Mathematical Sciences is launching two new courses, Mathematics of Finance I (MATH 466) and Mathematics of Finance II (MATH 467), which form a core part of the new Mathematics Major in development, a Financial Mathematics Concentration Track. The sequential courses will cover the mathematics currently used in financial industry, including interest theory, portfolio selection and valuation of financial derivatives. They will be offered for the first time during the academic year 2004-2005 and will run every other year thereafter.

Although this course is intended for advanced mathematics students, it might also be useful for students in the Business School with a strong mathematics background. With these new courses and the new applied math major-financial mathematics concentration track (soon to be approved), MSU joins the 60 or so institutions nationwide which offer specialized education in mathematics of finance, either as an independent program within the mathematics department or as a joint program offered by mathematics and economics departments.

New Masters and Certificate in Teaching Middle Grades Mathematics

Montclair State University is pleased to announce a new Master of Arts and post-baccalaureate certificate in Teaching Middle Grades Mathematics. The MA program is designed for teachers who are preparing to teach mathematics in the middle grades but are certified in disciplines other than mathematics. The program is built upon the five-course certificate that provides content preparation in the areas of algebra, geometry, number and operations, data and probability, and measurement. The six remaining courses provide breadth and depth in subject matter and mathematical pedagogy to further prepare teachers for today's recommended curricula.

Teachers who complete the new MA will have the mathematical knowledge and related pedagogical skills to be teacher leaders in their districts and, for some, at the state and regional level. The program of study combines the fundamental concepts and principles that underlie middle school mathematics and includes connections to topics in the mathematics curricula that precede and follow the middle school curriculum. Their increased content knowledge and pedagogical skill will result in an observable and enhanced level of confidence, enthusiasm and comfort with mathematics, which in turn will foster a deeper understanding and appreciation of mathematics in their

students. Middle grade students who experience a broad and rich exposure to mathematics will be academically prepared to succeed in a first course in algebra, either in the middle school or high school and thus have more options in terms of high school course selection, higher education and career paths.

Completion of the certificate enables teachers to be highly qualified in the language of the No Child Left Behind Act. Although the NJDOE has yet to release all of the specifics, we believe that an individual who completes the Master of Arts in Teaching Middle Grades Mathematics and achieves a satisfactory grade on a new Middle Grades Mathematics PRAXIS or other appropriate test will be certified to teach middle grades mathematics in New Jersey.

Those interested in applying for either the certificate or the master's program need to complete a graduate application available at <http://www.montclair.edu/graduate.shtml> or if you prefer, you can pick up a paper copy of the application outside the Graduate School's office in College Hall. There is a \$60 application fee. The phone numbers for the Graduate School are 973-655-5147 or 800-331-9207. The Fax number is 973-655-7869. For more information about the program send email to the program advisor, Ken Wolff at wolffk@mail.montclair.edu.

MSU's Service to NYC

On Sunday, March 28th, four members of the Department traveled to Pace University in Manhattan to serve as volunteer judges for the Greater Metropolitan New York Math Fair. Drs. Kimberly Burch, Youngna Choi, Michael Jones, and Mika Munakata helped to judge presentations made by high school students who were already selected as finalists in the competition. The Math Fair consists of four levels of competition and many different areas of mathematics, including algebra, combinatorics, computer science, game theory, number theory, real analysis, and topology just to name a few.

At each level, students were required to orally present their written research papers to a panel of judges as well as fellow students in their session. Students were awarded a gold, silver, or bronze medal based on the quality of their written paper, oral presentation, depth of understanding, and originality. Professors Burch, Choi, Jones and Munakata agreed that judging this contest was a rewarding experience because they could see that many high school students were excited about mathematics and that enthusiasm will continue to their college education.

Ludwik Kowalski Retires after 35 Years' Service

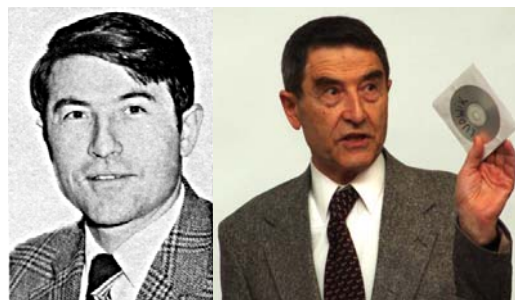
Dr. Ludwik Kowalski retired after 35 years of service at MSU as a professor of physics. A native of Warsaw, Poland, he studied electrical engineering in Poland and got a Ph.D. in nuclear physics at the University of Paris in Paris, France. He joined the Department of Physics & Geoscience (now Department of Mathematical Sciences) at MSU in 1969 and has been a permanent fixture of Richardson Hall until his retirement in May. He has given talks internationally and published over a hundred articles in numerous journals. He also has run a modeling workshop for physics teachers and was honored as a "Distinguished Scholar" at MSU.

Summing up his 35 years of experience in education Dr. Kowalski spoke about his view of college textbooks: "After teaching introductory physics courses for more than three decades I observe a trend which is, in my opinion, highly undesirable. While most of today's textbooks are excellent, on the whole they are too large and contain too much material. The situation in other areas of science is likely to be similar. I understand the motivation; the publishers want their books to be used in a variety of courses and they want teachers to decide what to cover and what to skip, according to specific needs. They also want to maximize sales. But what effect does book size have on students? I am not going to address the issue of cost of textbooks, except by noting that students are forced to pay for what is not used. My main concern is the possible psychological effect. Students are deprived of the

pleasure, which comes from the feeling of mastering "nearly everything" in a textbook.

A typical College Physics textbook, now over 1000 pages long, could be reduced to about 300 pages. The content should be limited to what can realistically be covered in the course for which the textbook is designed. If it were up to me I would decide (on the basis of a valid survey) what should be covered in all college physics courses, from community colleges to top universities. That "common denominator" would then be a guide for deciding what to retain and what to eliminate. Some topics would be shifted to advanced courses, as it used to be. Depth of coverage of basic material does not have to be sacrificed by reducing quantity. To satisfy specific needs would produce short supplements that could be purchased, only if needed."

Pictures of Dr. Kowalski:



When he started... and today.

Update on the Department Seminar

Our department has had a very active seminar series this semester thanks to co-organizers **Drs. Michael Jones, Arup Mukherjee, and Diana Thomas**. Several colleagues from around the country have stopped by to give research talks to our faculty and students. The diverse list of talks from Spring 2004:

- In February, Dr. Aziz Yakubu of Howard University spoke about a mathematical modeling, "Epidemics in Strongly Fluctuating Populations". This talk was a joint of the departmental and CSAM seminar series event.
- In March, Dr. Ethan Berkove of Lafayette College spoke on a "Gentle Introduction to

Algebraic Topology". This talk was well attended by our students.

- The last talk of the semester was given in April by Dr. Erik Bollt of Clarkson University. He spoke on "Inertial Manifolds And How To Use Them To Understand Some Applied Problems."

Watch the bulletin boards and our department web page for the Fall 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

Students have been very active presenting their research and pursuing graduate studies. **Steven Lettieri** and **Luba Lidman** gave talks at the Garden State Undergraduate Conference held at Rutgers, NJ in March. The students talked on their research in algebraic dynamics. Steven completed research under Dr. John Stevens and Dr. Diana Thomas. Luba Lidman worked with a group of students doing research under Dr. Michael Jones, Dr. Mark Korlie, and Dr. Diana Thomas. At the Saint Joseph's University Sigma Xi Student research conference in Philadelphia, PA. **Jason Long** (see picture), **Julian Montefusco**, and **Carmen Piccolo** presented posters of their research in population dynamics with Dr. Lora Billings.

Steven Lettieri, an undergraduate mathematics and physics major, was one of the prizewinners at a major national Mathematics Conference on undergraduate research. The competition was sponsored by the Committee on the Undergraduate Activities and Student Chapters, and was held at the joint national Meetings of the American Mathematical Society and Mathematical Association of America in Phoenix in January 2004. One hundred and sixteen students, from major research institutions such as MIT, Cornell, Princeton and smaller four-year colleges such as Mount Holyoke and the Clairmont Colleges, made presentations.

Cash prizes of \$100 were awarded to the top winners. Steven presented a poster about his research with Dr. John Stevens and Dr. Diana Thomas on characteristic and minimal polynomials of linear maps over finite fields. All students were judged on mathematical content, answers to questions and poster design. Congratulations to Steve and his faculty mentors.

Among those who graduate in May, several students continue their study of mathematics in graduate schools. **Steven Lettieri** and **Paul Belony** were offered positions as a doctoral candidate in physics at Lehigh University with full financial assistance. **Thomas Minter** has been admitted to Rutgers Graduate School for a Ph.D. program in Operations Research. **Shweta Seshadri** and **Richard F. Pechar** continue at MSU graduate school in statistics and mathematics, respectively.



Jason Long presents his malaria model.

Faculty Activities

Dr. Lora Billings had the article "Multi-scale continuum mechanics: From global bifurcations to noise induced high dimensional chaos," (with I. B. Schwartz, D. S. Morgan, and Y.-C. Lai) accepted to *CHAOS*. In February, she gave an invited presentation at Michigan State University on stochastic dynamical systems.

In April, **Dr. Youngna Choi** gave a presentation on mathematical ways of teaching arbitrage opportunities in the currency market. The presentation with her coauthor Dr. Yeomin Yoon of Seton Hall University, titled "A Heuristic Exercise on Triangular Arbitrage in the Currency Market" was given at the first joint meeting of the Allied Business Education Association (Academy of Business Education and Financial Education Association).

Dr. Michael Jones had several papers appear:

- Fairness, How to Achieve It, and How to Optimize in a Fair Division Procedure. M.A. Jones and S.F. Cohen. *Mathematics Teacher*, Volume 97, Issue 3, (March 2004), 170-174.
- Connecting Fair Division and Game Theory through the Optimization of Knaster's Procedure. M.A. Jones *PRIMUS (Problems, Resources, and Issues in Mathematics Undergraduate Studies)*. Vol XIII n4 (Dec. 2003), 321-336.
- Dynamic Models of Coalition Formation: Fallback vs. Build-Up. S.J. Brams, M.A. Jones, and D.M. Kilgour. *Graph Theory Notes of New York*, XLV, (Nov. 2003), 32-40.

Dr. Jones also had some references to his work appear in the popular press this term:

- Ben Stein (American Institute of Physics) refers to The Pythagorean Theorem of Baseball (joint with Linda Tappin) in *Inside Science News Service* "Streamlining the

'Pythagorean Theorem of Baseball' (3/29/04): <http://www.aip.org/isns/reports/2004/007.html>

- *Wall Street Journal's* Science Journal "Pigskin Overtime Rules And Beaned Batters Spur Math Theorems" by Sharon Begley refers to the articles: Whether You Win or Lose, It's How the Overtime is Played: A Markov Chain Analysis of the National Football League's Overtime Rules (M.A. Jones) and The Pythagorean Theorem of Baseball (1/9/04; pA07, first page of Market Place section)
- *Nature Online's* "Cake Cutting Perfected" by Philip Ball discusses my article: Perfect Cake-Cutting Procedures with Money (1/7/04; <http://www.nature.com/nsu/040105/040105-3.html>)

He also made the following presentation: Perfect Cake-Cutting Procedures with Money at the Public Choice Society Meetings; Baltimore, MD. March 2004. (The paper that this presentation was based on is of the same name and co-authored with S.J. Brams and C. Klamler.)

Dr. John Stevens and his colleagues at NJIT (G-H. Qian, I. W. Burdick, R. Pfeffer, and H. Shaw) had their article, "Soot removal from diesel exhaust using a rotating fluidized bed filter," published in *Advances in Environmental Research* [8 (2004) 387-395]. In it a mathematical model for soot capture was developed and used to interpret experimental data.

Dr. Diana Thomas gave invited presentations at Towson State University and Georgia Tech on maps over finite fields in March. She also gave an invited talk on a model for the accumulation of fat at the western section of the American Math Society held at University of Southern California in April.

CSAM 2004 Service Awards

All too often in a College we fail to recognize the essential nature of faculty service in keeping the Academy alive and moving forward. To help rectify and place service as an important, indeed essential component of faculty life, we have the annual CSAM faculty service awards. This year, the recipient from the Department is **Dr. Mark Kolie**.

The awardees represent individuals who have made important and lasting contributions to the Department, College and/or University. They receive an individual wall plaque, appropriate press notification, and a College awards luncheon reception. All awardees will have their names mounted on the plaque on display in the Dean's Office.
