

# DEPARTMENT OF APPLIED MATHEMATICS NEWSLETTER

*Solving complex problems with sophisticated mathematical methods*

## Weekly Problems Plague, Unite Students in IIT SIAM Chapter

This past year, students in the Department of Applied Mathematics formed a local chapter of the Society for Industrial and Applied Mathematics (SIAM), the largest professional organization within the worldwide applied math community. With more than 50 members, IIT SIAM has several regular events and has filled an important niche on campus.

"SIAM brings together graduate and undergraduate students both in the applied math department and from across campus," says Ben Niu (Ph.D. candidate), president of the chapter. "There wasn't a graduate student community within the department before. Since we have lots of graduate students and the program is expanding, this chapter allows them a chance to develop leadership on campus."

The chapter hosts a monthly Math Tea, where students and faculty can gather socially and exchange ideas, as well as sponsors a weekly problem contest. The weekly problem has become popular with undergraduates and has fostered interaction between the Math Club and SIAM.

Prepared by graduate students and posted on the chapter's website, the weekly

problem is open to all undergraduates, and the first student to send in a correct answer wins a \$15 prize. At the end of the year, weekly winners will be brought together for a Mathematics Day competition, where they will vie for larger prizes.

Niu also plans to expand the chapter and offer more opportunities to connect graduate students through a series called the Graduate Students Forum. Past events have included a careers seminar called "My Life as a Quant" and an introduction to the technical writing program LaTeX given by Assistant Professor Igor Cialenco.

"Eventually, I would like to have research talks given by graduate students, where they can present something they are working on or are interested in to other graduate students," says Niu. "We would like to provide for our members better, attract members from the engineering and computer science departments, and to make the chapter more reflective of the university community."

Founded to influence the use of math in a technological society, SIAM brings academic mathematicians together with engineers, industrial researchers, and scientists to

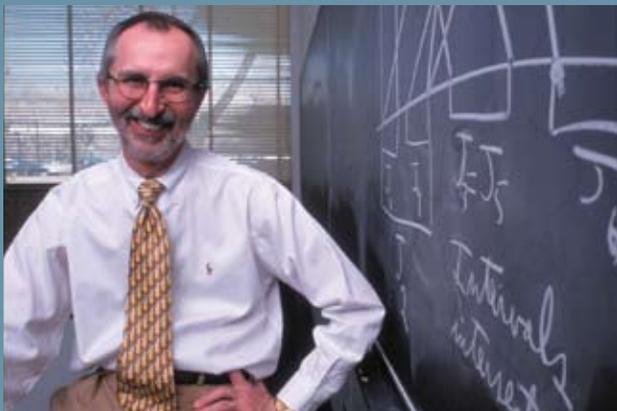
exchange ideas and further research. Six members of the faculty are members of this society, with Professor Fred Hickernell serving on the editorial board of *SIAM Journal on Numerical Analysis* and Senior Lecturer Charles Tier serving as an associate editor of *SIAM Journal on Applied Mathematics*. To keep up with the new IIT SIAM chapter, please visit [www.math.iit.edu/~siam](http://www.math.iit.edu/~siam).



Students Xingye Kan (Ph.D. candidate), Jiarui Yang (Ph.D. candidate), and Mingxi Ding (MMF candidate) take a break from studying at a recent IIT SIAM Math Tea.

Photo courtesy of Zhao Zhang

## Dean and Former Department Chair Retires



F. R. "Buck" McMorris retired this past spring from his position as dean of IIT College of Science and Letters. McMorris served at IIT for nine years, first as chair of the applied mathematics department and professor of applied mathematics and computer science, then as dean of the college for five years. He has published more than 100 research papers and two books. In celebration of McMorris's career, retirement, and 65th birthday, the department and CSL hosted BuckFest: A Conference in Honor of F. R. "Buck" McMorris last May. Fourteen invited speakers delivered talks in fields related to McMorris' specialties in discrete applied mathematics and computational biology. A complete list of events for the two-day celebration can be found at [www.math.iit.edu/Buck65.html](http://www.math.iit.edu/Buck65.html). McMorris and his wife, Peggy, will live in Louisville, Ky., and Chicago.

# STUDENT RESEARCH: Training the Next Generation

## Making Sense of Uncertainty: *Ph.D. Students Get Real-World Experience with Hedge Fund*

by Andrea and Luca Vidozzi (Ph.D. Candidates)

Photo courtesy of Joe Millham



Andrea and Luca Vidozzi work with Professor Tomasz Bielecki on their theses.

During the spring and summer semesters of 2008, we were employed as interns at a medium-sized hedge fund in South Florida, alongside our thesis advisor, Tomasz Bielecki. The fund had substantially increased its trading volume in the credit markets, and was planning to develop an in-house credit risk library. At the time, the fund's traders and risk managers used a leading commercial-software package, but felt the need for the extra flexibility provided by customized, proprietary software. In addition, the credit market started giving the first signs of the turbulence to come, and the standard industry models implemented by commercial vendors would often fail to be calibrated to the market data. Perfectly calibrated models are extremely important to traders and portfolio managers in order to reliably mark to the market and risk-manage their positions.

The task in front of us was challenging. First, we had to efficiently replicate the standard models for pricing and risk management of complex credit products, such as the now infamous CDOs (collateralized debt obligations), which received a substantial portion of the blame for the current credit crunch. Next, we were to develop and implement new models that could be consistently calibrated to market observables. This was the perfect opportunity to put to fruitful application our research, use many of the tools IIT provided us in the course of the doctoral program, and last but not least, escape the brutal Chicago winter!

The eight-month experience tested our skills in a broad range of disciplines of applied mathematics. The job required a deep understanding of advanced tools from probability, stochastic analysis, Monte Carlo simulation, and numerical simulation of partial differential equations, together with the ability to efficiently implement numerical algorithms in an object-oriented programming environment. The emphasis given by the IIT applied mathematics curriculum to both theoretical and applied aspects of the various mathematical disciplines proved invaluable to the successful completion of our task.

The hedge fund has now replaced the commercial credit risk library with its in-house analytics, and we maintain an ongoing consulting relationship with the fund.

## Student Research Grows

Student research output in the Department of Applied Mathematics has exploded over the past year, with several undergraduate and graduate students working with faculty in all of our research areas. As more of our students begin doing research, the department has announced the formation of the F. R. "Buck" McMorris Student Research Scholarship to support math students in their research with faculty.

The first McMorris Scholar, Xingye Kan (Ph.D. candidate), worked with professor Jinqiao Duan this past summer on researching random dynamics, an area she is exploring for her thesis and one of Duan's primary research interests. Christos Mitillos (AMAT, 4th year), who won the Dean's Summer Research Scholarship, worked with assistant professor Hemanshu Kaul in exploring fall coloring of graphs, a new research topic concerned with the feasibility of simultaneously solving two hard graph optimization problems. Kaul is also working with YoungJu Jo (AMAT and EE, 5th year) on a long-standing conjecture in the topic of "Art Gallery" problems from the fields of computational and discrete geometry.

Josh Tate (AMAT, 4th year) and Eugene Lamie (AMAT & CPE, 4th year) spent the past summer working with professors Fred Hickernell and Greg Fasshauer on a project for determining shape parameters of approximation functions. Using MATLAB and working with Brian Conley, a student from Chicago State University, and Chicago State Professor and IIT alumnus John Erickson (AMAT Ph.D. '07), they will continue this research during the school year that will move them toward a better understanding of reproducing kernel Hilbert spaces.

If you recognize how important research is as part of a student's education, please consider making a gift to support these scholarships (use the enclosed envelope).

## IIT Math Club Success

Last April, the 10 members of the IIT Math Club attended the 2008 meeting of the Illinois Section of the Mathematics Association of America at Eastern Illinois University, where they competed against 20 student teams from across Illinois. The team of Kevin Ventullo (AMAT, 4th year), Young Ju Jo (AMAT and EE, 5th year), and Anil Vasireddi (BME, 3rd year) took first place, earning each of them a copy of the software package Mathematica. The IIT team of Chris Mitillos (AMAT, 5th year), Laura Rodriguez-Mosquera (ECE, 3rd year), and Jeffrey Stanford (AMAT, 5th year) took third place overall, and the team of Jon Beagley (AMAT '08), Keith Campbell (EE, 5th year) and Tony Parrillo (AMAT, '08) was not far behind. Also attending was faculty advisor and Associate Professor Michael Pelsmajer, who gave a talk on "Crossing Numbers and Graphs with Rotation Systems."

## Menger Event Draws Alumni and Friends

Photo courtesy of Mandy Sherman



The second-annual IIT Karl Menger Lecture and Award event was a great success this past year, with 115 people connected to Menger and the department in attendance. Professor Lloyd N. Trefethen of Oxford University gave the featured lecture, while students and faculty presented current research generated in the department, and Menger's former students and colleagues shared memories of the mathematician and professor.

Next year's Remembering Karl Menger event will be held April 20, 2009, on IIT's Main Campus. Cornell University Professor Richard Durrett will give the 2009 Karl Menger Lecture, "Truth Is Stranger Than Fiction: A Look at Some Improbabilities." To see photos of the 2008 Remembering Menger Event and to check schedule updates for the 2009 event, please see the website [www.iit.edu/csl/am/about/menger](http://www.iit.edu/csl/am/about/menger).

## IIT Students Promote Science at LabFest!

The Interprofessional Projects class sponsored by the department (IPRO 330) continues for a fourth semester, reaching out to the community in new ways. This September, IIT students engaged hundreds of children and parents in math and science projects at *Labfest!*, an all-day event at the Museum of Science and Industry.

IPRO 330 develops and publicizes science fair resources, such as project ideas, data analysis guides, and presentation tips, which are all available at [sciencefair.math.iit.edu](http://sciencefair.math.iit.edu). The course advisors are professors Greg Fasshauer and Michael Pelsmajer.



Photos courtesy of Brianna Elg, BCPS

Andrew Mehr (PSYC 5th year), Mark Rhodes (EE 3rd year), and Rocio Diaz (BCPS CHEM 4th year) explain how vegetable oil can prevent a balloon from popping when a needle is stuck into it [top right]. Mehr talks with a boy about how different arrangements of M&Ms might allow him to place more candy in that box [left]. Xuan Kang (BME 4th year) talks with a parent about how this exercise leads to deeper ideas in geometry, while Diaz helps some students with their experiment [bottom right].

## Faculty News

- Tomasz Bielecki was promoted last February to professor of applied mathematics, and Michael Pelsmajer to associate professor of applied mathematics with tenure.
- Senior Lecturer David Maslanka was given the 2008 Bauer Family Award for Excellence in Undergraduate Teaching in April. The Bauer Award is the highest award for teaching that IIT offers, and nominees are chosen from student recommendations.
- Associate Professor Greg Fasshauer received the Dean's Award for Teaching Excellence in November 2007. Fasshauer was also appointed to the AMS' Menger Prize Committee, which evaluates mathematics entries to the Intel International Science and Engineering Fair.
- Chair and Professor Fred Hickernell received the Dean's Award for Outstanding Research by a Senior Faculty Member. Awardees are nominated by colleagues from among all CSL faculty.
- Associate Professor Michael Pelsmajer and assistant professors Robert Ellis and Hemanshu Kaul organized MIGHTY XLVII, the 47th Midwest Graph Theory Conference, at IIT November 7-8. There were 35 contributed talks as well as plenary lectures by Douglas West (University of Illinois at Urbana-Champaign) and Laszlo Babai (University of Chicago), with more than 70 participants overall.

# Applied Math Welcomes New Professor



**Name:** Shuwang Li

**Title:** Assistant Professor

**Education:** Ph.D. University of Minnesota–Twin Cities

**Professional Experience:**  
Visiting Assistant Professor,  
University of California–Irvine

Research and Teaching Assistant,  
University of Minnesota–Twin Cities

**Research interests:** Computational and applied mathematics, and numerical methods; current research involves the modeling of multi-physics problems with applications in materials science and biology

## Alumni News

Three alumni of the Department of Applied Mathematics were honored at the 2008 Alumni Awards, held in May.

**Sam Karlin (MATH '44, M.S. '45)** was given the IIT Lifetime Achievement Award for his contributions to the world of mathematics in several different fields, including the software used to first map the DNA sequences. Renowned for changing his research interests every seven years, Karlin made fundamental contributions in a variety of fields, and won several awards, including the National Medal of Science. He was Professor Emeritus of mathematics at Stanford University, where he had taught since 1956. Karlin passed away in December 2007, and is survived by his wife, Dorit Carmelli, and a large family.

**Edwin Stueben (MATH '58, M.S. '60, Ph.D. '63)** received the IIT Alumni Service Award for his more than 50 years of service to the IIT community. Stueben earned all three of his degrees at IIT and was a member of the department faculty and university administration, serving variously as department chair, director for the Center for Educational Development, and vice president of the university. He is currently Professor Emeritus of Mathematics.

**Gloria Ray Karlmark (CHEM '65)** was awarded the IIT Alumni Medal. A member of the Little Rock Nine, a group of students who integrated Little Rock Central High School in 1957, Karlmark earned a chemistry degree with a mathematics minor at IIT and has lived and worked in Europe since 1976 with her husband, an IIT Institute of Design graduate. Karlmark is now retired.

## Upcoming Events

### Joint Mathematics Meeting in D.C.

- January 5–8, 2009
- The department is hosting a dinner on January 7 for all who are interested. Contact Jackie Anderson in Alumni Relations at [jander20@iit.edu](mailto:jander20@iit.edu) or 312.567.5012 if you would like to join us.

### 2009 Remembering Karl Menger

- April 20, on IIT Main Campus
- Cornell University Professor Richard Durrett will present "Truth Is Stranger Than Fiction: A Look at Some Improbabilities."
- To RSVP, contact Patricia Cronin at [cronin@iit.edu](mailto:cronin@iit.edu) or 312.567.3132.

### 2009 IIT Commencement

- May 16, 2009, on IIT Main Campus

## Contact Us

Please send news of your professional or other achievements to:

### Illinois Institute of Technology

Attention: Michael Pelsmajer  
Department of Applied Mathematics  
Engineering 1 Building, Room 208  
10 W. 32nd Street  
Chicago, IL 60616

**Phone:** 312.567.8980

**FAX:** 312.567.3135

**newsletter@math.iit.edu**

**www.math.iit.edu**

Would you like email updates?

Please email us at

**newsletter@math.iit.edu**

### Fred Hickernell

*Department Chair*

### Gladys Collins

*Administrative Associate*

### Joe Millham

*Administrative Assistant and Newsletter*

ILLINOIS INSTITUTE  
OF TECHNOLOGY  
*Transforming Lives. Inventing the Future. [www.iit.edu](http://www.iit.edu)*

Department of Applied Mathematics  
Engineering 1 Building, Room 208  
10 West 32nd Street  
Chicago, IL 60616

NonProfit Org.  
US Postage  
**PAID**  
Chicago, IL  
Permit #936