UofL Math Gazette 2011 - 2012

The Newsletter of the
Department of Mathematics
College of Arts & Sciences
University of Louisville

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By now we all know that drastic budget cuts are a fact of life and having just weathered a 1% cut we are preparing for an additional 3% cut (or more?) for the coming year. With the decrease in state (and federal) funding for education, support from alumni becomes more and more important to the daily operation of departments. These funds are no longer "gravy" but are needed to keep our students from having ever larger classes and more and more debt. Endowments for scholarships that are based on performance have helped keep education more affordable for our best students and are enabling many to participate in conferences, research activities and create posters and publish. Prizes for those who go beyond the required have helped us attract some of the very best students to our program and they in turn have helped raise the level of instruction and undergraduate and graduate research.

Our undergraduate students continue to do well and we have a Math Squad, organized by Dr. Grzegorz Kubicki and Dr. Jake Wildstrom. These students are participating in the William Lowell Putnam Mathematical Competition and the Virginia Tech Regional Mathematics Contest. For the first time this year, we had a team of students participate in the Mathematical Contest in Modeling; Dr. Changbing Hu is the faculty adviser for this group.

New this year are Undergraduate Teaching Assistants (UTA's); through an NSF grant several STEM (**S**cience, **T**echnology, **E**ngineering, **M**athematics) departments were able to hire undergraduate students to support our large lecture classes via small section supplementary instruction. While still in the first semester of operations, this is turning out to be a great success. The UTA's are enjoying their work and via a supporting seminar co-taught by content and education faculty, are learning ways to engage and retain students in our general education classes. The faculty members working with the UTA's have also been pleased with their performance. Besides pay and the seminar, this teaching experience is enhancing our students' résumés and helping them in their job search and with applications to graduate schools.

Despite increased demands on their time, our faculty members work hard to further our education and research missions. Through a grant from the KY Council on Postsecondary Education, Dr. Steve Seif, Ms. Sue Holt, Ms. Mary Rising, and Ms. Marti Zimmerman were able to devote time to update our entry level courses and our teacher education courses to match up with the new Common Core Standards that KY and many other states adopted for measuring the College and Career

Readiness of our high school graduates. They as well as a large part of our faculty and graduate students participated in a one day seminar on the Common Core to learn what we can expect from our incoming students in the future. As Chair I continue to be involved in the Teacher Leadership Networks with OVEC and many meetings regarding the changes necessitated by the adoption of the Common Core.

The funding available for travel to conferences and to conduct research continues to decrease and thus has the number of presentations made. However, our faculty is still getting invited and many members have become resourceful in finding outside sources for such endeavors. For example, Dr. Steve Xu was invited to spend the spring term at the Chinese University in Hong Kong, and Dr. Darji will be spending part of the summer in Italy and he is also invited to travel to Hungary to serve on a dissertation committee. Dr. Cristina Tone received a travel award from the AWM (American Women in Math) to attend the annual meeting of the American Mathematical Society and Dr. Csaba Biró won the Victor Olorunsola Endowed Research Award. Thanks to the generosity of many of you, we have funding for scholarships and for some of our undergraduate and graduate students to attend meetings; several students made presentations at regional and national meetings.

Despite the economy there is still demand for our graduates; we receive requests ranging from companies wanting to hire actuaries, analysts and statisticians and from school districts for mathematics teachers. These companies and school districts often visit our department and make presentations to undergraduate and graduate students. We help by making space available for on-campus interviews right in our department. If your company has job or internship openings, is interested in making a presentation to our students, or would like interview our math majors, please contact me.

Finally, I would like to draw your attention to our 2012 William Marshall Bullitt Lecture, Dr. Erik Demaine from MIT; Thursday March 29, 2012 at 6:30 pm in Strickler Hall 101 (Middleton Auditorium); the title will be "Geometric Puzzles: Algorithms and Complexity. Dr. Demaine is Professor of Computer Science, a Mathematician and an Artist; his curved origami sculptures are in the permanent collection at the Museum of Modern Art in New York. At the beginning of the lecture, Mr. Lowry Watkins, grandson of William Marshall Bullitt, will award the Bullitt scholarship and the newly created William Marshall Bullitt Memorial award for the best paper by an undergraduate mathematics major. We thank him for his generosity.

Hopefully you will find something of interest in this issue and I encourage you to contact us and let us know your thoughts. We appreciate your comments and support; if you are in the area please stop by for a visit or just check us out at our website: http://www.math.louisville.edu

THE ANNUAL WILLIAM MARSHALL BULLITT LECTURE

The Bullitt Lecture in Mathematics is a free, public lecture that has brought to Louisville each year, beginning in 1993, a distinguished mathematician to speak to 200-500 audience members about important and cutting-edge mathematics. The emphasis has been drawing people from outside academia. Talented high school students, area professionals, and other parties interested in the impact and excitement that mathematics has generated, especially in the last decade, have attended the Bullitt Lecture in surprisingly large numbers.

The Lecture is endowed through a grant from the family of William Marshall Bullitt, the Solicitor General of the United States under President William Howard Taft. More information about the Bullitt Lectures and the celebrated William Bullitt Collection of Rare Mathematics and Astronomy Books can be found at the website http://www.math.louisville.edu/Bullitt/.

BULLITT LECTURE 2012

The 2011 Bullitt Lecture in Mathematics, a free lecture aimed at the general public, is on Thursday, March 29, 2012 at 6:30 p.m. in Strickler Hall 101. This year's speaker is Dr. Erik Demaine.

Erik Demaine is a Professor in Computer Science at the Massachusetts Institute of Technology. Demaine's research interests range throughout algorithms, from data structures for improving web searches to the geometry of understanding how proteins fold to the computational difficulty of playing games. He received a MacArthur Fellowship (2003) as a "computational geometer tackling and solving difficult problems related to folding and bending--moving readily between the theoretical and the playful, with a keen eye to revealing the former in the latter". Erik cowrote a book about the theory of folding, together with Joseph O'Rourke (Geometric Folding Algorithms, 2007), and a book about the computational complexity of games, together with Robert Hearn (Games, Puzzles, and Computation, 2009). His interests span the connections between mathematics and art, including curved ori-

gami sculptures in the permanent collection of the Museum of Modern Art (MoMA), New York.

Erik Demaine

Here are the title and abstract of Dr. Demaine's talk:

Geometric Puzzles: Algorithms and Complexity

I love geometry because the problems and solutions are fun and often tangible. Puzzles are one way to express these two features, and are also a great source of their own computational geometry problems: which puzzles can be solved and/or designed efficiently using computer algorithms? Proving puzzles to be computationally difficult leads to a mathematical sort of puzzle, designing gadgets to build computers out of puzzles. I will describe a variety of algorithmic and computational complexity results on geometric puzzles, focusing on more playful and recent results.

College and high school students, teachers, and many others from the community interested in the impact and excitement that mathematics has generated have attended recent Bullitt Lectures in large numbers. Everyone is welcome!

For more information about the Bullitt Lectures, please visit
http://www.math.louisville.edu/Bullitt/.

FACULTY HIGHLIGHTS AND NOTES

Dr. Jon-Lark Kim published a book "Selected Unsolved Problems in Coding Theory" with David Joyner from Birkhauser, 2011. He also was elected as an editor of the SCI journal "Designs, Codes, and Cryptography" in August 2011.

Dr. Alica Miller was an invited speaker at the International conference on measurable and topological dynamics, in Huang Shan City, China, in June of 2011 and received a travel grant from the AWM for this trip. She has also given a talk at a special session of the Joint AMS meeting in New Orleans in January 2011 and has visited the University of Illinois at Urbana-Champaign in March 2011, where she gave a seminar talk.

STUDENT NOTES

Dr. Douglas Lorenz graduated in Spring 2011 after completing his Ph.D. dissertation "Marginal Nonparametric Inference for Waiting Times in Multistage Models: Hypothesis Testing and Regression".

Dr. Xiao Wang graduated in Spring 2011 after completing her Ph.D. dissertation "Statistical Analysis and Data Mining of Medicare Patients with Diabetes".

Dr. Matt Zapf graduated in Summer 2011 after completing his Ph.D. dissertation "Cantor Set Approximations and Dimension Computations in Hyperspaces".

ACTUARIAL CLUB ACTIVITIES

The actuarial club had several activities of interest in the Fall 2010 semester:

- Maria Larsen and Tyler Peurach visited from Mercer on September 13, 2011.

- Jack Duncan (UofL alumni 1999, ASA), Matthew Hayes (UofL alumni 2003, FSA), and Kim Mattingly (Actuarial Development Program) visited from Humana on September 23, 2011.

- Wellpoint conducted interviews on campus in September/October 2011.

STUDENT HONORS/AWARDS

As always, we appreciate the kindness and generosity of alumni and other friends of mathematics. In many cases contributions were received in response to the department newsletter, the U of L Math Gazette. The department is thankful to alumni, friends and family who support the department endowments. Without your generosity, we would be unable to provide many of the offerings that make our department unique.

The **Ken F.** and **Sandra S. Hohman Fellowships** were awarded to Erika Foreman, Rasitha Jayasekera, Chad Money, and Charles Suer.

The **Robert J. Bickel Scholarship** was awarded to Jonathan Lamar.

The **C. Coleman Petty Scholarships** was awarded to Emily Haas.

The **Lois Pedigo Scholarship** was awarded to Ian Phillip.

The **Mary Ruth Brookover Award** was awarded to Brooke Houlette.

PUZZLE

Last year's puzzle
Suppose you plan to go to a store and want to carry enough change using quarters, dimes, nickels, and pennies so that
#1: you can pay any amount of change exactly and
#2: you can pay the change with the fewest number of coins possible.
So, for example, if you want to pay 30 cents and satisfy #2, you need to pay with a quarter and a nickel rather than 3 dimes. Suppose you have no idea what the change needed will be; it could be anything between 0 and 99 cents. What is the fewest number of coins that you need to carry in order to satisfy #1? in order to satisfy both #1 and #2?

What are the answers to each of the above questions if you can only use quarters, dimes, and pennies? (So, for example, if you want to satisfy #2, you need to pay 30 cents with 3 dimes rather than a quarter and 5 pennies.)

Solution – If you can use quarters, dimes, nickels, and pennies, you need at least 10 coins (3 quarters, 2 dimes, a nickel, and 4 pennies) to be able to pay any amount of change exactly (#1). The answer is the same for what is needed to satisfy both #1 and #2.

If you can only use quarters, dimes, and pennies, then you need at least 14 coins (3 quarters, 2 dimes, and 9 pennies) to be able to pay any amount of change exactly (#1). However, you need at least 16 coins (3 quarters, 4 dimes, and 9 pennies) to satisfy both #1 and #2.

New Puzzle

The endpoint of a needle is placed at point Q which is 1 foot away from a point P on a wall which is perpendicular to the line segment from P to Q. As illustrated below, let θ be the angle between a line which passes through Q and which is parallel to the wall and the needle. For one trial of an experiment, an angle θ is randomly selected to be some value between $0°$ and $180°$, inclusive. The needle points at R on the wall, and x indicates how far the point R is to the right of the point P (so if θ is greater than $90°$, then x is negative). If the experiment is repeated many times and x is recorded for each trial, then what can we say about the average of the recorded values of x? (Assume the wall has infinite length in each direction.)
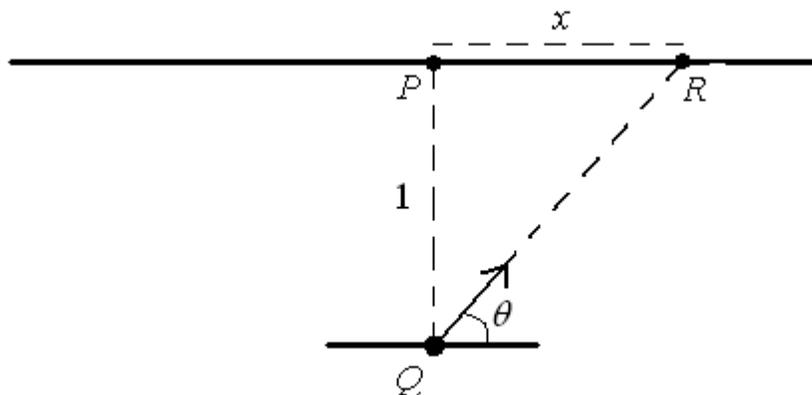
Please mail or e-mail your solution to: Dr. Ryan Gill rsgill01@louisville.edu – Math Dept, Louisville, KY 40292.

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