UofL Math Gazette 2010 - 2011

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

Photo of Natural Sciences Building by Jaime Gill

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Despite another year of budget problems, the Mathematics Department is making good progress in teaching and research. Most notably Jon-Lark Kim was granted tenure and promoted to the rank of Associate Professor. As reported in the last newsletter, we were able to fill three permanent positions. These faculty members, Dr. Csaba Biró, Dr. Jinjia Li and Dr. Cristina Tone, have adjusted well to their new positions, are very active in research and teaching and are already picking up some service obligations. All have submitted external grant proposals, are actively involved in seminars and are working with our undergraduate and graduate students.

Since there are several state and local efforts to increase the number of college graduates and in particular STEM (Science, Technology, Engineering, Mathematics) graduates, the number of students we teach continues to increase. This allowed us to add one term assistant professor, Dr. Daniel Smith, who received his Ph.D. from Indiana University, Bloomington last year in the area of quantum cryptography. He works primarily with prospective teachers. Dr. Susan White continues to expand our Dual Credit program, where we offer college level classes in area high schools. This helps students get a leg up on their college career, and will make it easier for them to major in mathematics intensive subjects. Marti Zimmerman coordinates our supplemented mathematics program with the help of Sue Holt and Carrye Wilkins. They teach students who do not quite meet the college standards but who are likely to succeed with some additional help. This program has been highly successful in getting students through the general education mathematics requirement without the need for developmental classes. We also continue to work closely with JCPS and other school districts to help ease the transition from high school to college and are an integral part of work on College Readiness that is led by the Council on Postsecondary Education. As chair, I now spend a fair amount of time in committee meetings in Frankfort and am involved in the new Teacher Leadership Networks where teachers learn about the new Common Core Standards for Mathematics that have been adopted by Kentucky and many other states. These standards are used to judge College and Career Readiness.

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. 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 as well as for our Math Club and other activities to get students more engaged with their education.

The Department will be hosting the 24th Cumberland Conference on Combinatorics, Graph Theory, and Computing May 12 to 14. This conference brings together researchers in the area of discrete mathematics and is funded by the National Science Foundation, the Logistics and Distribution Institute and the Department of Mathematics. Dr. André Kézdy chairs the organizing Committee which also consists of Dr. Csaba Biró, Dr. Ewa Kubicka, Dr. Grzegorz Kubicki, Dr. Susan White, Dr. Jacob Wildstrom and Adam Jobson.

We are still getting many requests for our graduates ranging from companies wanting to hire actuaries and analysts to 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.

We also had several changes in staffing: Mrs. Barbara Newlin, our Unit Business Manager retired after many years at the University and almost 10 years in our Department. Faculty and Staff organized a retirement party and presented Barbara with a nice Mantel Clock. This retirement allowed us to promote Mrs. Shelly Schroll from Administrative Assistant to Unit Business Manager and Mrs. Rebecca Korfhage to Administrative Assistant. Unfortunately, Becky realized that what she really wanted was to spend more time with her children and returning to college, so she resigned at the end of 2010. We had already hired Mrs. Gabrielle Ferris as our new “front desk person” in September and were able to add Ms. Lisa Norman as our new Administrative Assistant this January. Everyone is doing a wonderful job and they all “hit the ground running”. In them we have a great team who keeps the day-to-day operations of the Mathematics Department flowing with seeming ease.

Finally, I would like to draw your attention to our 2011 William Marshall Bullitt Lecture, which will be given by Dr. Neil J. A. Sloane of AT&T Shannon Labs. Dr. Sloane is well known for his work on error-correcting codes, sphere packing, optics and integer sequences. He has been running the On-Line Encyclopedia of Integer Sequences for 47 years. He is a member of the National Academy of Engineering, an AT&T Fellow, and an IEEE Fellow. He has received numerous awards, including the Chauvenet Prize of the MAA, the IEEE Hamming Medal, and the Shannon Award of the IEEE Information Theory Society. The title of this year’s Bullitt Lecture is “*The On-Line Encyclopedia of Integer Sequences*” and it

will be held on Thursday March 24, 2011 at 6:00 pm in Strickler Hall 101 (Middleton Auditorium). At the beginning of the lecture, Mr. Lowry Watkins, grandson of William Marshall Bullitt, will award the Bullitt scholarship.

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 2011

The 2011 Bullitt Lecture in Mathematics, a free lecture aimed at the general public, will take place Thursday, March 24, 2011 at 6 p.m. in Strickler Hall 101. This year's speaker will be Dr. Neil J. A. Sloane.

Neil J. A. Sloane received his Ph.D. in electrical engineering from Cornell University in 1967. After two years as an assistant professor there, he joined AT&T Bell Labs (now AT&T Shannon Labs), where he has been ever since. He is the author or coauthor of books on error-correcting codes, sphere packing, integer sequences, optics, and rock climbing. He is a member of the National Academy of Engineering, an AT&T Fellow, and an IEEE Fellow. He has received numerous

awards, including the Chauvenet Prize of the MAA, the IEEE Hamming Medal, and the Shannon Award of the IEEE Information Theory Society.

Neil J. A. Sloane

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

The On-Line Encyclopedia of Integer Sequences

What comes next after 0, 1, 3, 6, 2, 7, 13, 20, 12? If you come across a number sequence in your work or on a test, and you don't want to have to think too hard, there's only one thing to do: consult the On-Line Encyclopedia of Integer Sequences (OEIS). I've been running this database for 47 years, and in this talk I will mention some of my favorite sequences, such as the toothpick sequence, the EKG sequence, the lovely orchard problem, and the dismal prime numbers. The database contains nearly 200,000 sequences, and is now a "wiki" (see oeis.org). Besides plotting sequences you can also listen to them, so there will be music and a movie.

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/.

WELCOME NEW FACULTY

Dr. Csaba Biro is originally from Hungary; he earned his Ph.D. at the Georgia Institute of Technology. He joined us after a two-year visiting assistant professor position at the University of South Carolina. His interests are combinatorics, partially ordered sets, and graph theory. He is married with two children. In his spare time enjoys music, hiking, and running.

Dr. Jinjia Li received his Ph.D. from University of Illinois at Urbana-Champaign. He then spent two years as a postdoc at Syracuse University. Before he joined the department of Mathematics at the University of Louisville as an assistant professor, he was an assistant professor at Middle Tennessee State University. His research interests include commutative algebra and algebraic geometry. He is teaching abstract algebra II this semester. During his spare time, Dr. Li enjoys sports and music. He also enjoys watching cartoons with his son.

Dr. Daniel Smith is currently a Visiting Assistant Professor at the Univeristy of Louisville. He was awarded his Ph.D. in mathematics and M.S. in Computer Science at Indiana University under the advisement of Professor Jee Heub Koh for his work in Multivariate Post-Quantum Cryptography. His research endeavors to discover a model of security appropriate in the post-quantum world in which the classical number theoretic schemes which have been the foundation of digital communication are no longer viable. As well as being recently invited to present his work at various international conferences and symposia and an invitation to design and administer a short crypto course at a Brazilian Summer School, he has also been recently honored for his teaching accomplishments with the Rothrock Teaching Award from Indiana University. His current teaching activity consists of teaching a course on mathematical reasoning for primary school teachers, and his involvement in an NSF ENGAGE project to determine the utility of using Everyday Examples in the STEM classroom.

Dr. Cristina Tone joined the UofL department of Mathematics in the fall of 2010 as an Assistant Professor, after she finished her Ph.D. at Indiana University under the direction of Professor Richard Bradley. Her work concentrates in Probability Theory, more precisely in limit theorems for random fields that satisfy certain strong mixing conditions. Her first teaching experience was as a high school student, and since then she has had the opportunity to teach a variety of courses. Her favorite course that she has taught so far, though, is the Introduction to Probability course, MATH 561, offered here at UofL.

FACULTY HIGHLIGHTS AND NOTES

Dr. Jon-Lark Kim was promoted to Associate Professor. He also visited POSTECH, Korea, and Huazhong Normal University, China with seminar lectures as a visiting professor last summer.

Dr. Kiseop Lee was a recipient of the World Class University (WCU) grant from the Graduate Department of Financial Engineering, Ajou University via the WCU Project sponsored by the Korean Ministry of Education, Science and Technology from 2010 through 2013.

ACTUARIAL CLUB ACTIVITIES

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

- **MERCER seminar:** Maria Larsen and Tyler Peurach visited from Mercer on September 10, 2010.

- **AEGON seminar:** Jeremy Vessels (ASA, UofL BA in math), Tammy Jellison (HR), and Heather Pohlman (HR) visited from Aegon on October 15, 2010.

- **WELLPOINT interviews:** Mike Stone (Actuarial Director) and Matthew Lewis (Actuarial Analyst) visited from Wellpoint on November 9, 2010.

- **HUMANA seminar:** Jack Duncan (UofL alumni 1999, ASA) and Matthew Hayes (UofL alumni 2003, FSA) visited from Humana on November 12, 2010.

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 **Robert J. Bickel Scholarship** was awarded to James Meyer.

The **C. Coleman Petty Scholarships** were awarded to Katherine Herrick and Ian Phillip.

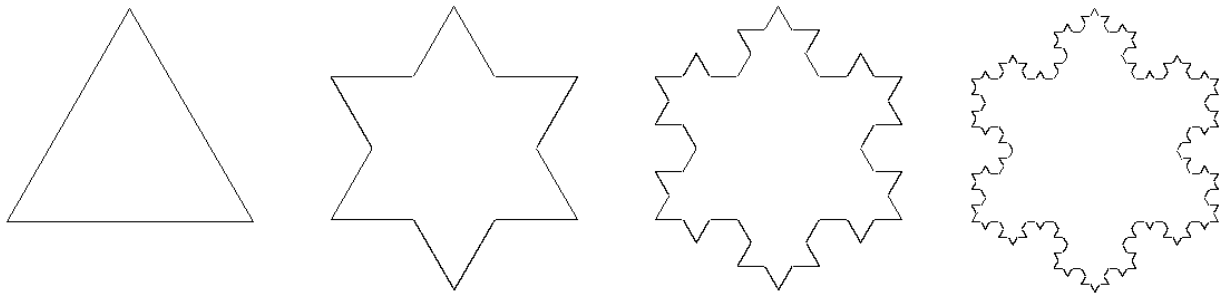
The **Lois Pedigo Scholarship** was awarded to Stephen Leach.

The **Mary Ruth Brookover Award** was awarded to Joseph D. Moore.

PUZZLE

Last year's puzzle

Suppose we construct a sequence of simple polygons as follows. The initial polygon S_0 is an equilateral triangle with side length 1. Then, for each positive integer i, the ith polygon S_i is defined recursively based on S_{i-1} as follows. Take each side of S_{i-1} and split it into three parts; insert an equilateral triangle pointing outwards with the middle third as the base; remove the middle third. The first four polygons in this sequence are shown below.



S_0 S_1 S_2 S_3

As we let N diverge to infinity, what happens to the area of S_N? What happens to the perimeter of S_N?

Solution – As N diverges to infinity, the resulting curve is known as the Koch snowflake. S_0 *is a triangle with base* 1 *and height* $\sqrt{3}/2$*, so the area of the* S_0 *is* $\sqrt{3}/4$*. For any positive N,* S_{N-1} *has* $3\times 4^{N-1}$ *sides of length* 3^{1-N} *so the area of* S_N *is* $(3\times 4^{N-1})\times(3^{1-N}/3)^2\left(\sqrt{3}/4\right)=3/4\times(4/9)^N\left(\sqrt{3}/4\right)$ *plus the area of* S_{N-1}*. So we have that the area of* S_N *is*

$$\frac{\sqrt{3}}{4}+\frac{\sqrt{3}}{4}\times\frac{3}{4}\times\left(\frac{4}{9}\right)+\frac{\sqrt{3}}{4}\times\frac{3}{4}\times\left(\frac{4}{9}\right)^2+\ldots+\frac{\sqrt{3}}{4}\times\frac{3}{4}\times\left(\frac{4}{9}\right)^N=\frac{\sqrt{3}}{4}\times\frac{8-3(4/9)^N}{5}$$

and, as N diverges to infinity, the area of S_N converges to $\frac{\sqrt{3}}{4}\times\frac{8}{5}\approx 0.69282$. *This is related to A010502 in Sloane's On-Line Encyclopedia of Integer Sequences.*

Since S_N has 3×4^N *sides of length* 3^{-N}, *the perimeter of S_N is*

$$3\times 4^N\times\left(\frac{1}{3}\right)^N=3\left(\frac{4}{3}\right)^N$$

so, as N diverges to infinity, the perimeter of S_N also diverges to infinity.

New 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.)

Please mail or e-mail your solution to: Dr. Ryan Gill rsgill01@louisville.edu – Math Dept, Louisville, KY 40292.

Mathematics Department Donation Card

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Thanks for your generosity!