

# Goodsell Gazette

Carleton College

30 September 2016

Northfield, MN 55057

The newsletter for the Carleton mathematics and statistics community

Vol. 35, No. 02



## Meet You New Professors!

### Liz Sattler



Liz Sattler comes to us from North Dakota, where she grew up and attended college. She received both her undergraduate and graduate degrees from North Dakota State University. While at NDSU, she also taught graduate classes. Liz is fascinated by many aspects of mathematics including fractal geometry, symbolic dynamics, and ergodic theory. Summed up in one sentence Liz is interested in finding ways to compare very irregular shapes and connections with symbolic dynamics. She is excited about the passionate students and faculty at Carleton and the positive spirit that they bring to their work. "Everyone seems to be grateful for teaching and learning at Carleton." In her free time, Liz likes to do yoga, lift weights with her husband, and cook. Liz is teaching Calculus II this term and will also be teaching Multivariable

Calculus and supervising a comps project later in the year.

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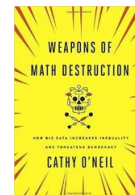
## Summer Research Symposium & Celebration

The 2016 Summer Research Symposium & Celebration will take place Friday, October 21 in the Weitz Center Commons from 3:30-5:30 p.m. The registration deadline is Friday, October 7 at 5:00 p.m. Students presenting posters must register at [https://apps.carleton.edu/campus/lrc/calendar/student\\_research/](https://apps.carleton.edu/campus/lrc/calendar/student_research/).

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## The Dangers of Big Data

How is society being controlled by Mathematical Algorithms? Inspired by the book, Weapons of Math Destruction, Cath O'Neil a mathematician turned social activist is warning that big data is essentially driving inequality in society. This is because mathematical computer algorithms are now in charge of making important decisions that affect our daily lives, which would previously have been made by discerning humans. More information on this article can be found at the International Business Times website.



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## Proofs and Confirmations: The Story of the Alternating Sign Matrix Conjecture

**Speaker:** David M Bressoud, DeWitt Wallace Professor, Macalester College

**Date:** Tuesday, October 4, 4pm

**Location:** CMC 206

What is the role of proof in mathematics? Most of the time, the search for proof is less about establishing truth than it is about exploring unknown territory. In finding a route from what is known to the result one believes is out there, the mathematician often encounters unexpected insights into seemingly unrelated problems. I will illustrate this point with an example of recent research into a generalization of the permutation matrix known as the alternating sign matrix. This is a story that began with Charles Dodgson (aka Lewis Carroll), matured at the Institute for Defense Analysis, drew in researchers from combinatorics, analysis, and algebra, and ultimately was solved with

insights from statistical mechanics. This talk will take place on Tuesday, October 4 from 4:00 to 5:00 p.m. in CMC 206.

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## **Winter Break Research Funding Opportunity**

The Towsley Endowment provides financial support for Carleton students working with Carleton science and math faculty on campus (or in the field) during summer and over winter break. The Kolenkow-Reitz Fund provides student stipend and travel support for Carleton students working with non-Carleton science and math faculty at another institution during winter break. Awards fund student stipends (\$440/week for full-time work) for up to 3 weeks during winter break and can include expenses for travel, lodging, and meals. No award will exceed \$1500. Note that students must work full-time in order to qualify. Carleton students are eligible to apply for this funding. Before applying, students should have already contacted and discussed the nature and timing of their project with the person they are planning to work as well as a faculty member at Carleton who can vouch for the project. Please note that previously funded students through the Kolenkow-Reitz Fund (winter break or summer) are less likely to get funded, but are still eligible to apply. The application deadline is Thursday, October 13, 2016 at 5:00 p.m. Questions? Please contact Jennifer Wolff ([jwolff@carleton.edu](mailto:jwolff@carleton.edu)). More details can be found at <https://apps.carleton.edu/mathscience/faculty/studentresearchaway>.

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## **Job, Internship, and Graduate Opportunities**

### **Math Curriculum Designer**

This is a full-time, entry-level position. IXL is seeking motivated curriculum designers to join their math content team. As a curriculum designer at IXL, you will design engaging online math problems from pre-kindergarten to algebra and collaborate with software engineers and visual designers throughout the development cycle. Your educational insight, creative solutions, strong writing skills, and perfectionist mindset will drive the success of their math product. A Bachelor's degree in Mathematics is required. Apply via the Tunnel by October 21, 2016.

### **Research Assistant: Economics**

AEI is seeking full-time research assistants to work with senior economists. AEI economists study a wide variety of economic policy issues related to the U.S. economy, tax policy, international finance, political economy, energy and the environment, financial services, technology and innovation, and healthcare. New research assistants will begin in summer 2017. Responsibilities include research support in the form of data management, retrieval, and analysis; editing and contributing to scholarly papers, articles, op-eds, and books; creating and formatting charts, graphic displays, and tables; and writing literature reviews and background reports using national and international publications. Applicants should have a demonstrated interest in economics and public policy as well as experience with economic methodologies, acquiring data from official sources, analyzing large data sets, and knowledge of statistical programs preferably STATA. A strong math/statistics background is required, and coursework in linear algebra, multivariable calculus, and econometrics is strongly preferred. AEI offers a stimulating and harmonious work environment and excellent benefits. Interested candidates should submit their resume, cover letter, unofficial academic transcripts, and 500-word writing sample with their on-line application by October 23, 2016.

### **New York Federal Reserve: Research Analyst**

Research Analysts play an integral role in both the policy and research functions of the Research and Statistics Group. Their economists, whose specialties include banking and payment systems, capital markets, international economics, macroeconomics, and microeconomics, work closely with Research Analysts. Upon leaving the Fed, Research Analysts who choose to apply to graduate school are consistently accepted by top programs; others pursue a wide variety of public and private sector opportunities. In recent years, RAs have gone on to pursue PhDs in Economics or Finance at MIT, Harvard, Stanford, Princeton, University of Chicago, UC Berkeley, and Wharton, among others. Previous RAs have also gone to law and public policy programs at Harvard Kennedy School, Princeton, Yale, and others. They seek candidates who have records of superior scholarship and academic curiosity. Research Analysts usually come from strong economics, policy, mathematics, or computer science backgrounds, though a major in one of these fields is not a necessity. Successful candidates often have previous research experience, and many are considering careers in economic research, public policy, or other related fields. In addition, we seek candidates from a wide range of backgrounds that are typically underrepresented in economics. It is important to us that we succeed in recruiting a diverse cohort of research analysts each year.

Thus we encourage many students with varying experiences and backgrounds to apply. Applications are being accepted now, on a rolling basis, at [www.newyorkfed.org/careers](http://www.newyorkfed.org/careers). It is recommended that candidates apply by October 15th.

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### PROBLEMS OF THE FORTNIGHT

To be acknowledged in the next *Gazette*, solutions to the problems below should reach me by noon on Tuesday, October 11. (By the way, for multi-part problems, such as the first problem below, if you only solve one part, you're still welcome to submit that partial solution.)

1. An unlucky frog can only exist at points in the plane with integer coordinates. What's more, the frog can only get from one point to another by taking a hop (in any direction) of length exactly 13; if two points are not at distance 13 from each other, the frog can only get from one to the other by a series of such hops, and every point where it lands must have integer coordinates.

- a) Show that the frog can actually get from any point to any other point in the plane (with integer coordinates).
- b) Find, with proof, the least number of hops that will get the frog from (0,0) to (1,1).

2. For vectors in  $\mathbb{R}^3$ , the cross product operation is not associative; that is,  $(\mathbf{a} \times \mathbf{b}) \times \mathbf{c}$  is usually not equal to  $\mathbf{a} \times (\mathbf{b} \times \mathbf{c})$ . Is there any restriction at all on what the two "cross products of three factors" considered here can be? That is, given vectors  $\mathbf{v}, \mathbf{w}$  in  $\mathbb{R}^3$ , are there always vectors  $\mathbf{a}, \mathbf{b}, \mathbf{c}$  to be found for which  $\mathbf{v} = (\mathbf{a} \times \mathbf{b}) \times \mathbf{c}$  and  $\mathbf{w} = \mathbf{a} \times (\mathbf{b} \times \mathbf{c})$ ? If so, show why; if not, give an example of specific vectors  $\mathbf{v}, \mathbf{w}$  for which no such  $\mathbf{a}, \mathbf{b}, \mathbf{c}$  exist.

The first problem posed September 16 was solved, although not always with a complete argument, by an impressive list of people: Sophie Gunn and Solomon Foster (joint communication), Liyang Liu, Marshall Ma, "Möbius Quip", Yuki Segawa, and Ben Stone. Good work, all! Yuki should stop by CMC 217 to collect an item from the B.B.O.P. Meanwhile, a solution to the second problem came in from John Snyder in Oconomowoc, but there are no student solutions yet.

- Mark Krusemeyer

If you're having trouble seeing the Problem of the Week, try enabling images for the message.

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*Web & Subscriptions:* **Sue Jandro**

