

## Center for Applied Mathematics

This colloquium series, sponsored by the Center for Applied Mathematics, is intended to introduce the University of St. Thomas community to a variety of problems, careers, and professional activities involving applications of mathematics. All presentations will be held in the 3M auditorium in the Owens Science Hall, Frey Science and Engineering Center, located at the southwest corner of Summit and Cretin Avenues in St. Paul (see map on back side). All talks start at 4:30 pm with refreshments at 4:15 pm.

**September 23, 2009** “*Did You Say You Could Care Less About Polynomials?*”, Bahman Kalantari, Rutgers University. Maybe you can differentiate and integrate polynomials and think that's all there is to them. Maybe you are an artist who laughs at the idea you could use polynomials to create artwork. Maybe you feel polynomials are solely mathematicians' toy. Maybe you never even heard of the term. Maybe you know Galois Theory, the Fundamental Theorem of Algebra, Newton's method, Fractals and a lot more. Maybe you have no fantasy of polynomials ever being named after you, like Chebyshev, Legendre, or Jones. Maybe you think solving polynomial equations is ancient history. Whatever you are thinking, *Polynomiography* will change your mind! Solving a polynomial equation is a game of hide-and-seek with a bunch of dots on a painting canvas. Polynomiography is the algorithmic visualization of the process of searching for the dots, and painting the canvas along the way. You can use Polynomiography in art, math, science, education, or just for fun. Perhaps the most significant application of polynomials is yet to emerge.

**October 21, 2009** “*Taming Random Knots*”, Eric Rawdon, University of St. Thomas. Polymers (think plastics) can be modeled as polygons moving randomly in space. In the case of polymer loops, we get knots and this makes knot theorists very happy. Having the knot in the loop affects what the loops look like, both the size of the loops and the shape, so the big question is how to quantify that change. What can we say about the effect of the knot on the average size and shape? Does the effect change as the length of the polymer increases? We will explore the modeling of polymers via random knots, concentrating on some recent work using ellipsoids to describe the knots.

**November 18, 2009** “*Biological swarms and their mathematical models*”, Chad Topaz, Macalester. Biological aggregations such as insect swarms, bird flocks, and fish schools are arguably some of the most common and least understood patterns in nature. These groups are thought to arise chiefly from "social forces" acting on individual organisms, such as attraction (for protection and mate choice) and repulsion (for collision avoidance). In this talk, I will introduce biological swarms and describe a mathematical modeling approach. I will also present research on locust swarms performed with two undergraduate research students. The mathematical model is a high-dimensional system of ordinary differential equations incorporating gravity, wind, and social interactions. In certain parameter regimes, the model has emergent "rolling" solutions morphologically similar to locust swarms observed by biologists.

**December 9, 2009** “*Yes I Do Use Calculus Everyday in My Work*”, Gary Hatfield, Securian Financial Group. There are many professions (Engineering, actuarial, statistics, etc) where one must take Calculus and other math courses as part of their training. It is not uncommon for persons in those jobs to say something like "I almost never use calculus in my work" OR "I hardly ever use all that math I had to learn in college". For me (and most of my colleagues), that is not the case. In my job as an Investment Actuary, I use undergraduate mathematics quite frequently. In this talk, I will discuss how I use concepts from calculus, probability and linear algebra on an everyday basis.



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