

THE MATHEMATICS DEPARTMENT PRESENTS

# A MATHEMATICS COLLOQUIUM

TUESDAY, May 26, 2009

BOND HALL 217

4:00 pm

**Title: Equivalence of Connect, Impossibility of Fair Votes, and the Hex Game Theorem**

**Speaker: Meghan VanderMale**, Western Washington University

**Abstract:** What conditions make a voting system “fair?” Is our voting system fair? In his study of Social Choice, Kenneth Arrow considers 4 “fairness” conditions that a voting system should meet. It turns out that not only does our own system not meet these conditions, but *no* voting system can meet all 4 of them. This result is called *Arrow’s Impossibility Theorem*. In the game of Hex two players compete to be the first to lay a path of colored tiles across a common pond. Is there always a winner? Does a continuous function on a square always leave a point unchanged? It turns out that these three seemingly unrelated questions have related answers. In my talk, I will present some basic voting theory and the ideas behind the 4 fairness conditions. In addition, I will discuss the Hex Game Theorem, its equivalency to the Brouwer-Fixed Point Theorem, and how it proves Arrow’s Impossibility Theorem. The first half of the talk can be understood by those with only a basic mathematical background and the second half will require some analysis background.

Refreshments will precede the talk at 3:30pm in Bond Hall 300  
courtesy of Dr. Edoh Amiran