THE MATHEMATICS DEPARTMENT PRESENTS

A MATHEMATICS COLLOQUIUM

MONDAY, January 28, 2008
BOND HALL 227
4:00 pm

Title: **An Introduction to Noncommutative Geometry**

Speaker: **Adam Nyman**, University of Montana

Abstract: Given a system of polynomial equations (in n unknowns) with real coefficients,

$$f_1(x_1, \ldots, x_n) = \cdots = f_r(x_1, \ldots, x_n) = 0$$

can we find all real $d \times d$ matrix solutions, i.e. can we find all n-tuples of real $d \times d$ matrices $M_1, \ldots, M_n$ such that

$$f_1(M_1, \ldots, M_n) = \cdots = f_r(M_1, \ldots, M_n) = 0?$$

When $d = 1$, solutions are elements of $\mathbb{R}^n$. The set of all solutions is a geometric object called a variety. Algebraic geometry is the study of the interplay between the geometry of the variety and the nature of the polynomials $f_1, \ldots, f_r$.

When $d > 1$, it is often true that $MN \neq NM$ for $d \times d$ matrices M and N, so in this case, our equations are "noncommutative". Is there still a bridge between the worlds of algebra and geometry? We describe recent efforts to make sense of the notion "noncommutative variety". We shall see that, while some important noncommutative varieties don't have any points, they can be embedded in slightly larger spaces which have enough points so that they can be understood geometrically.

Refreshments will precede the talk at 3:30pm in Bond Hall 300
courtesy of David Hartenstine.