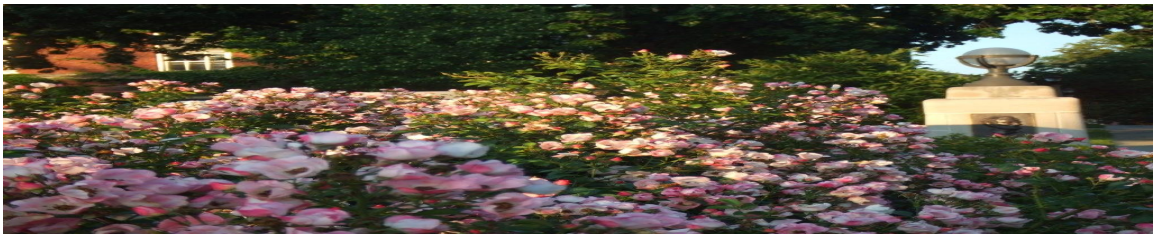
ISU ALGEBRA SEMINAR



FALL 2016 SCHEDULE

Wednesdays, 11:00 AM-11:50 AM at Williams Hall, room 21
Refreshments will be provided.

November 2, 2016

Speaker: Alberto Delgado

How do you get from a geometric object to a "related" algebraic object? One simple way is to associate to each geometric object (such as a graph) its group of automorphisms. Going backwards, from an algebraic object to a geometric object, is usually more difficult.

Let's begin with this question: From a collection of 24 players, can you pick 8-player teams so that any five players play together on a unique team? Each way of doing this gives rise to a geometric object called a (24, 8, 5)-Steiner system. The permutations of the 24 players where teams map to teams forms the Mathieu group M_24.

In this talk I'll first construct a special 3-dimensional subspace of a 6-dimensional vector space over the field for elements. This subspace, called the Hexacode, has magical error-correcting properties. The Hexacode, in turn, gives birth a spine-tingling 12-dimensional subspace of a 24-dimensional vector space over the field of 2 elements. This is the famous Golay code that the Viking 1 and 2 spacecrafts used to send back fabulous pictures of Jupiter and Saturn. The error-correcting properties of the Golay code vastly exceed that of the Hexacode. Working together, these codes gives rise to the Magic Octad Generator and the (unique!) (24, 8, 5)-Steiner system. The group of automorphisms of this system is a finite simple group whose existence gives rise many other finite simple groups.

I'll construct these objects with my bare hands (and nothing up my sleeve). Come equipped with paper and pencil so you can see follow along with the calculations.