October 5: Eric Marberg (MIT) "Character constructions for finite algebra groups."

An algebra group is a group of formal sums $1 + X$, with X ranging over all elements of a nilpotent finite-dimensional algebra over a finite field. Such groups form a relatively well-behaved class of p-groups, containing as prototypical examples the unitriangular groups of n-by-n upper triangular matrices with all diagonal entries equal to one. The (complex) irreducible characters of algebra groups—and especially the unitriangular groups—have remained a mystery to group theorists for some time, and will likely continue to do so. Obviating this difficulty, Diaconis and Isaacs introduced a simple construction giving the "supercharacters" of an algebra group: a certain family of reducible characters, with a number of remarkable properties, whose constituents partition of the set of all irreducible characters. In this talk, I will discuss a reformulation of Diaconis and Isaacs's definition, and show how it can be extended to construct a generally much larger family of orthogonal characters of an algebra group. As applications, I will give a direct construction of some "exotic" irreducible characters of the unitriangular group taking values in arbitrarily large cyclotomic fields. I will also briefly present an algorithm to count an algebra group's irreducible characters, which can be used to investigate some conjectures concerning whether the number of irreducible characters of the unitriangular group over a field with q elements in a polynomial in q.