

**Speaker:** Dr. Mikko Korhonen, University of Manchester

**Title:** Unipotent elements in irreducible representations of simple algebraic groups

**Abstract:** In this talk, I will give an introduction to some problems concerning the subgroup structure and representation theory of simple algebraic groups.

We will start from the basic examples of algebraic groups, the general linear group  $GL(V)$  and the special linear group  $SL(V)$ . The question of classifying maximal subgroups in groups of classical type such as  $SL(V)$  will lead us to questions about irreducible representations of simple algebraic groups.

To understand the subgroups of linear groups corresponding to irreducible representations of simple algebraic groups, one approach is to classify them by the elements that they contain. Certain types of linear maps place heavy restrictions on the possible groups and representations that can occur, and in some cases one can even give a complete classification. Related to this, I will say something about the following question and other related problems.

*Let  $G$  be a simple algebraic group over an algebraically closed field, and let  $f : G \rightarrow SL(V)$  be a rational irreducible representation. For each unipotent element  $u \in G$ , what is the Jordan normal form of  $f(u)$ ?*

Solutions to this question in specific cases have found many applications, one basic motivation being in the problem of determining the conjugacy classes of unipotent elements contained in maximal subgroups of simple algebraic groups.