Title: *Classical groups acting on polytopes*

Abstract: The existence of a flag transitive action of a group G on an abstract regular polytope of rank r is equivalent to the existence of a generating sequence $t_0, t_1, \ldots, t_{r-1}$ of distinct involutions of G satisfying:

(i) $[t_i, t_j] = 1$ for $1 \leqslant i < j \leqslant r-1$ if and only if $j - i > 1$; and

(ii) for all $I, J \subseteq \{0, \ldots, r-1\}$, $\langle t_i \colon i \in I\rangle \cap \langle t_j \colon j \in J\rangle = \langle t_k \colon k \in I \cap J\rangle$.

This talk concerns the existence of such actions for classical subgroups G of $\mathrm{GL}(V)$, and for their projective variants, where V is a finite vector space. I will promote an approach to the problem that seeks to use the natural geometries on V associated to such groups. As an illustration of this geometric approach, I consider the case when V is 3-dimensional, and prove that the only absolutely irreducible subgroups of $\mathrm{GL}(V)$ that admit a flag transitive action on an abstract regular polytope are orthogonal groups.