

**Title:** Applications of group geometry to extremal graph theory

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**Abstract:** We begin our talk by discussing certain problems from extremal graph theory which directly or indirectly relate the size of a graph to its girth. In each case, solutions are afforded by certain geometric structures called *generalized polygons*. While these structures are incredibly versatile, a result of Walter Feit and Graham Higman shows that they are also quite rare. The main body of the talk is devoted to a doubly-infinite family of objects we constructed with the intent of circumventing the limitations imposed by the Feit-Higman Theorem. Our construction depends heavily on the existence of certain group theoretic models of generalized polygons which can be embedded into Lie algebras. (We may even attempt a crash course on Lie groups and Lie algebras at this stage, but this is entirely negotiable.) We end our talk by discussing some properties of these new objects and their sundry applications, both pure and applied.