

THE GEOMETRY AND COMPLEXITY OF BALANCED GROUP PRESENTATIONS

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A finite presentation of a group is said to be balanced if the number of generators is the same as the number of relations. I shall begin this talk by reviewing why this condition is important in the study of manifolds of dimension 4 and less. I shall then explain some novel constructions of balanced presentations that have implications in topology, particularly to the construction of homology 4-spheres and to the conjectures of Andrews-Curtis and Zeeman. I shall also describe a new class of groups where determining the non-existence of a balanced presentation would settle the long-standing Relation Gap Problem. And if time allows, I shall sketch how a certain class of balanced presentations played a key role in my solution with Grunewald of Grothendieck's problem concerning groups with isomorphic profinite completions.

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