

GEOMETRIC GROUP THEORY: SUMMARY

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The origin of geometric group theory as a recognized subfield of mathematics was Gromov's insight that even mathematical objects such as groups, which are defined completely in algebraic terms, can be profitably viewed as geometric objects and studied with geometric techniques. Gromov used this idea to find ingenious solutions to old problems in algebra and topology, and in the process introduced new ways of understanding and classifying abstract algebraic objects. Contemporary geometric group theory has broadened its scope considerably, but retains the basic philosophy of reformulating in geometric terms problems from diverse areas of mathematics and then solving them with a variety of tools. New tools and ideas continue to be introduced regularly into the field, both invigorating it and giving promise of new applications.

The growing list of areas where this approach has been successful includes low-dimensional topology, the theory of manifolds, algebraic topology, complex dynamics, combinatorial group theory, algebra, logic, the study of various classical families of groups, Riemannian geometry and representation theory. The most recent of these successes was the program to establish subgroup separability results via non-positively curved cube complexes. This program, initiated by Wise and developed extensively by Wise and his coauthors over the last 20 years, led to the solution of the Baumslag Conjecture and culminated in the breakthrough result of Agol which settled Thurston's virtual fibering conjecture

Among other recent developments are impressive works on surface subgroups, the geometry of $CAT(0)$ -spaces, the geometry of mapping class groups and $Out(F_n)$, the Hanna Neumann conjecture, various versions of amenability, the property of rapid decay, the geometry of lattices in semisimple groups, profinite groups, rotating families, and homology stability.

The goals of this MSRI program are to bring together people from the various branches of the field in order to consolidate recent progress, chart new directions, and train the next generation of geometric group theorists.

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