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Sinopsis

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This book presents an introduction to the geometric group theory associated with nonpositively curved cube complexes. It advocates the use of cube complexes to understand the fundamental groups of hyperbolic 3-manifolds as well as many other infinite groups studied within geometric group theory.

The main goal is to outline the proof that a hyperbolic group G with a quasiconvex hierarchy has a finite index subgroup that embeds in a right-angled Artin group. The supporting ingredients of the proof are sketched: the basics of nonpositively curved cube complexes, wallspaces and dual CAT(0) cube complexes, special cube complexes, the combination theorem for special cube complexes, the combination theorem for cubulated groups, cubical small-cancellation theory, and the malnormal special quotient theorem. Generalizations to relatively hyperbolic groups are discussed. Finally, applications are described towards resolving Baumslag's conjecture on the residual finiteness of one-relator groups with torsion, and to the virtual specialness and virtual fibering of certain hyperbolic 3-manifolds, including those with at least one cusp.

The text contains many figures illustrating the ideas.

A co-publication of the AMS and CBMS.