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# Geometric Group Theory

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# Geometric Group Theory Geometric Group Theory

**Michael Seilmaier**



## **Geometric Group Theory Geometric Group Theory:**

**Topics in Geometric Group Theory** Pierre de la Harpe, 2000-09-15 In this book Pierre de la Harpe provides a concise and engaging introduction to geometric group theory a new method for studying infinite groups via their intrinsic geometry that has played a major role in mathematics over the past two decades A recognized expert in the field de la Harpe adopts a hands on approach illustrating key concepts with numerous concrete examples The first five chapters present basic combinatorial and geometric group theory in a unique and refreshing way with an emphasis on finitely generated versus finitely presented groups In the final three chapters de la Harpe discusses new material on the growth of groups including a detailed treatment of the Grigorchuk group Most sections are followed by exercises and a list of problems and complements enhancing the book s value for students problems range from slightly more difficult exercises to open research problems in the field An extensive list of references directs readers to more advanced results as well as connections with other fields

**Geometric Group Theory: Volume 1** Graham A. Niblo, Martin A. Roller, 1993-07-30 For anyone whose interest lies in the interplay between groups and geometry these books will be an essential addition to their library **Geometric Group**

**Theory** Clara Löh, 2017-12-19 Inspired by classical geometry geometric group theory has in turn provided a variety of applications to geometry topology group theory number theory and graph theory This carefully written textbook provides a rigorous introduction to this rapidly evolving field whose methods have proven to be powerful tools in neighbouring fields such as geometric topology Geometric group theory is the study of finitely generated groups via the geometry of their associated Cayley graphs It turns out that the essence of the geometry of such groups is captured in the key notion of quasi isometry a large scale version of isometry whose invariants include growth types curvature conditions boundary constructions and amenability This book covers the foundations of quasi geometry of groups at an advanced undergraduate level The subject is illustrated by many elementary examples outlooks on applications as well as an extensive collection of exercises **Geometric Group Theory** Mladen Bestvina, Michah Sageev, Karen Vogtmann, 2014-12-24 Geometric group

theory refers to the study of discrete groups using tools from topology geometry dynamics and analysis The field is evolving very rapidly and the present volume provides an introduction to and overview of various topics which have played critical roles in this evolution The book contains lecture notes from courses given at the Park City Math Institute on Geometric Group Theory The institute consists of a set of intensive short courses offered by leaders in the field designed to introduce students to exciting current research in mathematics These lectures do not duplicate standard courses available elsewhere The courses begin at an introductory level suitable for graduate students and lead up to currently active topics of research The articles in this volume include introductions to CAT 0 cube complexes and groups to modern small cancellation theory to isometry groups of general CAT 0 spaces and a discussion of nilpotent genus in the context of mapping class groups and CAT 0 groups One course surveys quasi isometric rigidity others contain an exploration of the geometry of Outer space of actions

of arithmetic groups lectures on lattices and locally symmetric spaces on marked length spectra and on expander graphs Property tau and approximate groups This book is a valuable resource for graduate students and researchers interested in geometric group theory Titles in this series are co published with the Institute for Advanced Study Park City Mathematics Institute Members of the Mathematical Association of America MAA and the National Council of Teachers of Mathematics NCTM receive a 20% discount from list price *Geometric Group Theory* Ruth Charney, Michael Davis, Michael Shapiro, 2011-06-24 This series is devoted to the publication of monographs lecture resp seminar notes and other materials arising from programs of the OSU Mathematical Research Institute This includes proceedings of conferences or workshops held at the Institute and other mathematical writings *Geometric Group Theory* Cornelia Druțu, Michael Kapovich, 2018-03-28 The key idea in geometric group theory is to study infinite groups by endowing them with a metric and treating them as geometric spaces This applies to many groups naturally appearing in topology geometry and algebra such as fundamental groups of manifolds groups of matrices with integer coefficients etc The primary focus of this book is to cover the foundations of geometric group theory including coarse topology ultralimits and asymptotic cones hyperbolic groups isoperimetric inequalities growth of groups amenability Kazhdan's Property T and the Haagerup property as well as their characterizations in terms of group actions on median spaces and spaces with walls The book contains proofs of several fundamental results of geometric group theory such as Gromov's theorem on groups of polynomial growth Tits's alternative Stallings's theorem on ends of groups Dunwoody's accessibility theorem the Mostow Rigidity Theorem and quasiisometric rigidity theorems of Tukia and Schwartz This is the first book in which geometric group theory is presented in a form accessible to advanced graduate students and young research mathematicians It fills a big gap in the literature and will be used by researchers in geometric group theory and its applications *Office Hours with a Geometric Group Theorist* Matt Clay, Dan Margalit, 2017-07-11 Geometric group theory is the study of the interplay between groups and the spaces they act on and has its roots in the works of Henri Poincaré Felix Klein J H C Whitehead and Max Dehn *Office Hours with a Geometric Group Theorist* brings together leading experts who provide one on one instruction on key topics in this exciting and relatively new field of mathematics It's like having office hours with your most trusted math professors An essential primer for undergraduates making the leap to graduate work the book begins with free groups actions of free groups on trees algorithmic questions about free groups the ping pong lemma and automorphisms of free groups It goes on to cover several large scale geometric invariants of groups including quasi isometry groups Dehn functions Gromov hyperbolicity and asymptotic dimension It also delves into important examples of groups such as Coxeter groups Thompson's groups right angled Artin groups lamplighter groups mapping class groups and braid groups The tone is conversational throughout and the instruction is driven by examples Accessible to students who have taken a first course in abstract algebra *Office Hours with a Geometric Group Theorist* also features numerous exercises and in depth projects designed to engage readers and

provide jumping off points for research projects

**Geometric Group Theory** Goulnara N. Arzhantseva, Laurent Bartholdi, Jose Burillo, Enric Ventura, 2007-09-24 This volume has its origins in the Barcelona Conference in Group Theory July 2005 and the conference Asymptotic and Probabilistic Methods in Geometric Group Theory held in Geneva June 2005 Twelve peer reviewed research articles written by experts in the field present the most recent results in abstract and geometric group theory In particular there are two articles by A Juh sz

*Geometric Group Theory Down Under* John Cossey, 1999 Seventeen contributions from the July 1996 conference present current research in the theory of algebraic groups the theory of automatic and hyperbolic groups convergence groups distortion of subgroups Artin groups and braid groups amenable groups combinatorial approaches to conformal structure algebraic and geometric automorphism groups and geometric invariants of groups Some of the specific topics are the topology of polynomial varieties the intersection of flat subsets of a braid group embedding free amalgams of discrete groups in non discrete topological groups automatic structures on central extensions and whitehead graphs on handlebodies No index Annotation copyrighted by Book News Inc Portland OR

Geometric Group Theory: Volume 2 Graham A. Niblo, Martin A. Roller, 1993-08-12 The articles in these two volumes arose from papers given at the 1991 International Symposium on Geometric Group Theory and they represent some of the latest thinking in this area Many of the world s leading figures in this field attended the conference and their contributions cover a wide diversity of topics This second volume contains solely a ground breaking paper by Gromov which provides a fascinating look at finitely generated groups For anyone whose interest lies in the interplay between groups and geometry these books will be an essential addition to their library

**Combinatorial and Geometric Group Theory** Sean Cleary, 2002 This volume grew out of two AMS conferences held at Columbia University New York NY and the Stevens Institute of Technology Hoboken NJ and presents articles on a wide variety of topics in group theory Readers will find a variety of contributions including a collection of over 170 open problems in combinatorial group theory three excellent survey papers on boundaries of hyperbolic groups on fixed points of free group automorphisms and on groups of automorphisms of compact Riemann surfaces and several original research papers that represent the diversity of current trends in combinatorial and geometric group theory The book is an excellent reference source for graduate students and research mathematicians interested in various aspects of group theory

**Groups, Languages and Geometry** Robert H. Gilman, 1999 This volume contains the proceedings of the AMS IMS SIAM Joint Summer Research Conference on Geometric Group Theory and Computer Science held at Mount Holyoke College South Hadley MA The conference was devoted to computational aspects of geometric group theory a relatively young area of research which has grown out of an influx of ideas from topology and computer science into combinatorial group theory The book reflects recent progress in this interesting new field Included are articles about insights from computer experiments applications of formal language theory decision problems and complexity problems There is also a survey of open questions in combinatorial group theory The volume will interest group theorists topologists and experts in

automata and language theory      **Geometric Methods in Group Theory** José Burillo, 2005 This volume presents articles by speakers and participants in two AMS special sessions Geometric Group Theory and Geometric Methods in Group Theory held respectively at Northeastern University Boston MA and at Universidad de Sevilla Spain The expository and survey articles in the book cover a wide range of topics making it suitable for researchers and graduate students interested in group theory      Topology and Geometric Group Theory Michael W. Davis, James Fowler, Jean-François Lafont, Ian J.

Leary, 2016-09-14 This book presents articles at the interface of two active areas of research classical topology and the relatively new field of geometric group theory It includes two long survey articles one on proofs of the Farrell Jones conjectures and the other on ends of spaces and groups In 2010 2011 Ohio State University OSU hosted a special year in topology and geometric group theory Over the course of the year there were seminars workshops short weekend conferences and a major conference out of which this book resulted Four other research articles complement these surveys making this book ideal for graduate students and established mathematicians interested in entering this area of research

**Combinatorial and Geometric Group Theory** Oleg Bogopolski, Inna Bumagin, Olga Kharlampovich, Enric Ventura, 2011-01-28 This volume assembles several research papers in all areas of geometric and combinatorial group theory originated in the recent conferences in Dortmund and Ottawa in 2007 It contains high quality refereed articles developing new aspects of these modern and active fields in mathematics It is also appropriate to advanced students interested in recent results at a research level      From Groups to Geometry and Back Vaughn Climenhaga, Anatole Katok, 2017-04-07 Groups arise naturally as symmetries of geometric objects and so groups can be used to understand geometry and topology Conversely one can study abstract groups by using geometric techniques and ultimately by treating groups themselves as geometric objects This book explores these connections between group theory and geometry introducing some of the main ideas of transformation groups algebraic topology and geometric group theory The first half of the book introduces basic notions of group theory and studies symmetry groups in various geometries including Euclidean projective and hyperbolic The classification of Euclidean isometries leads to results on regular polyhedra and polytopes the study of symmetry groups using matrices leads to Lie groups and Lie algebras The second half of the book explores ideas from algebraic topology and geometric group theory The fundamental group appears as yet another group associated to a geometric object and turns out to be a symmetry group using covering spaces and deck transformations In the other direction Cayley graphs planar models and fundamental domains appear as geometric objects associated to groups The final chapter discusses groups themselves as geometric objects including a gentle introduction to Gromov's theorem on polynomial growth and Grigorchuk's example of intermediate growth The book is accessible to undergraduate students and anyone else with a background in calculus linear algebra and basic real analysis including topological notions of convergence and connectedness This book is a result of the MASS course in algebra at Penn State University in the fall semester of 2009      *Geometric Group Theory* Graham A.

Niblo, Martin A. Roller, 1993 The articles in these two volumes arose from papers given at the 1991 International Symposium on Geometric Group Theory and they represent some of the latest thinking in this area This first volume contains contributions from many of the world's leading figures in this field and their contributions demonstrate the many interesting facets of geometrical group theory For anyone whose interest lies in the interplay between groups and geometry these books will be an essential addition to their library Geometric group theory Walter D. Neumann, Michael Shapiro, 1996

**Combinatorial and Geometric Group Theory, Edinburgh 1993** Andrew J. Duncan, N. D. Gilbert, James Howie, 1995 The ICMS Workshop on Geometric and Combinatorial Methods in Group Theory held at Heriot Watt University in 1993 brought together some of the leading research workers in the subject Some of the survey articles and contributed papers presented at the meeting are collected in this volume The former cover a number of areas of current interest and include papers by S M Gersten R I Grigorchuk P H Kropholler A Lubotzky A A Razborov and E Zelmanov The contributed articles all refereed range over a wide number of topics in combinatorial and geometric group theory and related topics The volume represents a summary of the state of knowledge of the field and as such will be indispensable to all research workers in the area Topics in Groups and Geometry Tullio Ceccherini-Silberstein, Michele D'Adderio, 2022-01-01 This book provides a detailed exposition of a wide range of topics in geometric group theory inspired by Gromov's pivotal work in the 1980s It includes classical theorems on nilpotent groups and solvable groups a fundamental study of the growth of groups a detailed look at asymptotic cones and a discussion of related subjects including filters and ultrafilters dimension theory hyperbolic geometry amenability the Burnside problem and random walks on groups The results are unified under the common theme of Gromov's theorem namely that finitely generated groups of polynomial growth are virtually nilpotent This beautiful result gave birth to a fascinating new area of research which is still active today The purpose of the book is to collect these naturally related results together in one place most of which are scattered throughout the literature some of them appearing here in book form for the first time In this way the connections between these topics are revealed providing a pleasant introduction to geometric group theory based on ideas surrounding Gromov's theorem The book will be of interest to mature undergraduate and graduate students in mathematics who are familiar with basic group theory and topology and who wish to learn more about geometric analytic and probabilistic aspects of infinite groups

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