

## introductory

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- [Lie Groups and Lie Algebras - YouTube](#)
- Borchers - [Lie groups - YouTube](#)
- [Introduction to Lie Theory](#)
- [Short course on Lie Groups by M.S. Raghunathan - YouTube](#)

## Lie groups and Lie algebras

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- [Introduction to Lie Groups \(Fall 2020, ETHz\) \(部分\) \\_哔哩哔哩\\_bilibili](#)
  - <https://metaphor.ethz.ch/x/2020/hs/401-3225-00L/>
- [AIC - Compact Lie groups and their representations \(2022\)- Prof. M. S. Raghunathan, Centre for Basic Sciences, Mumbai - YouTube](#)
  - [AIC - Compact Lie groups and their representations \(2022\)](#)
  - [notes](#)
- [Unitary Representations of Lie Groups | ETH Zürich Videoportal](#)
  - [Unitary | Books](#)
- [Anupam Singh - AIS on Lie Algebras \(4-23 July 2011\) CMI-IMSc, Chennai \(google.com\)](#)
  - [CMI Lie algebras - YouTube](#)
- [Introduction to Lie Algebras Doutorado IMPA Verao 2011 Reimundo Heluani 03/01/2011 aula 01 parte1 \(youtube.com\)](#)

## Lie groups and symmetric spaces

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- [A guide through the theory of symmetric spaces](#)
- [Programa de Doutorado: Lie Groups, Representation Theory and Symmetric Spaces - YouTube](#)
- [Muna Naik - Riemannian Symmetric Space](#)
  - [Riemannian Symmetric Spaces - an introduction \(Muna Naik\)](#)
- [Homogeneous Dynamics and Geometry in Higher-Rank Lie Groups - YouTube](#)
- [Geometry, Groups and Dynamics \(GGD\) - 2017 | ICTS](#)

## broader topics

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- [Harish-Chandra & Centenary Celebrations at HRI](#)
  - [Syllabus](#)
- [The year-long program on Harish-Chandra's birth centenary - YouTube](#)
  - [Harish-Chandra Lectures series at Bhaskaracharya Pratishthana and IISER Pune](#)
- [Discrete subgroups of Lie groups - YouTube](#)
- [Rigidity - FRH - YouTube](#)
  - there's some notes in [Alp Uzman's Webpage](#)
- [Nigel Higson: Parabolic induction - YouTube](#)
- [Nigel Higson: Real reductive groups, K-theory and the Oka principle - YouTube](#)
- [Fields Academy Shared Graduate Course: Automorphic Forms and Representation Theory: an introduction to the Langlands Program | Fields Institute for Research in Mathematical Sciences](#)

## Geometric representation theory

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- [Borel–Weil–Bott theorem - Wikipedia](#)
- [Raphaël Rouquier - Geometric representation theory as representation-theoretic geometry \(youtube.com\)](#)
- [Geometric Representation Theory\\_哔哩哔哩\\_bilibili](#)
- [Workshop on Representation Theory and Geometry - YouTube](#)
- [Hodge theory & Unitary representations - YouTube](#)

## symplectic geometry and representation theory

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- [HIM Lectures: Trimester Program "Symplectic Geometry and Representation Theory" - YouTube](#)

## ergodic theory and Lie groups

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- [Uri Bader: course in groups and ergodic theory in Wroclow - YouTube](#)

## Banach algebras, C\*-algebras

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- [Harmonic Analysis and Banach Algebras. A. Pirkovskii. Fall 2024. - YouTube](#)
- [C\\* algebras and spectral theorem - YouTube](#)
- [C\\* Algebra Course Lecture\\_哔哩哔哩\\_bilibili](#)
- [A. Yu. Pirkovskii. C\\*-algebras and compact quantum groups. Spring 2021 - YouTube](#)
- [C\\*-Algebras and Compact Quantum Groups. Pirkovskiy A. Y. Spring 2024 - YouTube](#)
- [K-Theory of C\\*-Algebras \(2025\) - YouTube](#)

## group actions

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- [Lie Groups and Geometric Aspects of Isometric Actions - Google Books](#)

## transformation groups

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- [Differential Geometry 2 - Symmetric Spaces \(Winter semester 2020-2021\)](#)
  - [He] Helgason: Differential Geometry, Lie groups and Symmetric Spaces.
  - [Ma] Maubon: [Riemannian symmetric spaces of the non-compact type: differential geometry](#).
  - [Io] Iozzi: [Symmetric spaces](#).
  - [Ba] Ballmann: [Symmetric spaces](#).
  - [Pa] Paulin: [Groupes et Geometries](#).
  - [Eb] Eberlein: Geometry of non positively curved manifolds.
  - [DC] Do Carmo: Riemannian geometry.
  - [BH] Bridson, Haefliger: Metric spaces of non-positive curvature.
  - [Ha] Hatcher: Algebraic topology.
  - [Sc] Schroeder: [Symmetrische Räume](#).
  - [HI] Holland and Ion: [Notes on symmetric spaces](#).
  - [Bo] Borel: Semisimple Groups and Riemannian Symmetric Spaces.
  - [KN] Kobayashi, Nomizu: Foundations of Differential Geometry vol. 1 and 2.
  - [Lo] Loos: Symmetric Spaces, vol. 1 and 2.
  - [Wo] Wolf: Spaces of constant curvature.
  - [Pa] Paradan: Symmetric spaces of the non-compact type: Lie groups.
- - [【ETHZ】Symmetric Spaces 对称空间\\_哔哩哔哩\\_bilibili](#) gone! 😞
  - <https://metaphor.ethz.ch/x/2021/fs/401-3226-00L/#classes>
  - [https://metaphor.ethz.ch/x/2024/hs/401-3226-00L/Literature/lecture\\_notes\\_final.pdf](https://metaphor.ethz.ch/x/2024/hs/401-3226-00L/Literature/lecture_notes_final.pdf)
- [Muna Naik - Riemannian Symmetric Space](#)
  - [Riemannian Symmetric Space-An introduction: Lecture-1 \(Muna Naik\)](#)
- [Basics on Hermitian Symmetric Spaces](#)
- [https://www.imo.universite-paris-saclay.fr/~daniel.monclair/poly\\_groupes\\_geo.pdf](https://www.imo.universite-paris-saclay.fr/~daniel.monclair/poly_groupes_geo.pdf)
- [https://math.berkeley.edu/~jawolf/publications.pdf/paper\\_019.pdf](https://math.berkeley.edu/~jawolf/publications.pdf/paper_019.pdf)
- <https://www.math.ucdavis.edu/~kapovich/EPR/msri.pdf>
- [Classical Lie groups](#)
- <https://metaphor.ethz.ch/x/2023/fs/401-3226-00L/literature/MaubonSymSpaces.pdf>

- [The General Noncompact Symmetric Space | SpringerLink](#)

## Symmetric spaces, nonpositive curvature and rigidity

Mostow rigidity:

- Mostow/Gromov Thurston notes, Benedetti-Petronio, Martelli all have versions of this
- Munkholm's survey paper on Gromov's version  
<https://link.springer.com/chapter/10.1007/BFb0099242>
- Barycenter method Besson-Courtois-Gallot and the barycenter method Minimal entropy and Mostow's rigidity theorem
- Quasiconformal method Tukia's proof, given in Drutu and Kapovich's geometric group theory book, chapter 22;
- Gehrig and Martin's book "An Introduction to the Theory of Higher Dimensional Quasiconformal Mappings" has a nice self-contained chapter giving a proof of Mostow using this argument.
- Too low dimension "Mostow rigidity on the line" is the title of a survey paper of S. Agard, outlining results of Tukia, Sullivan, and others.
- Local rigidity Bergeron-Gelander's note on local rigidity.

Books for broader reference on semi-simple groups:

- [Dave Witte Morris - Arithmetic groups](#)
- The appendix to [Ballman-Gromov-Schroeder](#) gives an intro on Weyl Chambers and does an example for  $SL(n, \mathbb{R})$ . This is good to know!

Other rigidity theorems:

- Ghys' actions of lattices on the circle (french). Any action of a lattice in a semi-simple Lie group basically factors through a surjection of that group onto  $PSL(2, \mathbb{R})$ .  
<http://perso.ens-lyon.fr/ghys/articles/actionsreseaux.pdf>. There is an outline of the proof in Ghys' groups acting on the circle survey paper, it is a nice way to get into the theory of lattices in semi-simple Lie groups.
- Rich Schwartz's Pattern rigidity
- Further reading on the Barycenter method related to BCG: Connel, Farb Some recent applications of the barycenter method in geometry  
<https://arxiv.org/abs/math/0204093>

- [David Fisher - group actions](#)
- [Amie Wilkinson. Geometry, Dynamics, and Rigidity](#)
- [superrigidity and arithmeticity](#)
- [LECTURES ON SPACES OF NONPOSITIVE CURVATURE](#)

- [Cusps of hermitian locally symmetric spaces.pdf](#)
- [Rigidity on symmetric spaces - ScienceDirect](#)
- [QUASI-CONFORMAL GEOMETRY AND MOSTOW RIGIDITY by Marc BOURDON](#)
- [Arithmetic-in-the-geometry-of-symmetric-spaces.pdf](#)
- [geodesic\\_flow\\_symmetric\\_space.pdf](#)
- hyperbolic
  - [The\\_Visual\\_Boundaries\\_of\\_Hyperbolic\\_Spaces-PaulaHeim.pdf](#)
  - [NCHG.pdf](#)
- [Volumes of arithmetic locally symmetric spaces and Tamagawa numbers - Peter Smillie](#)
- [What Information Might the Topology of Locally Symmetric Spaces Contain? - Ideas | Institute for Advanced Study](#)
- [\[2303.00578v2\] Quantum-Classical Correspondences for Locally Symmetric Spaces](#)

## Mostow

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- [mostow.pdf](#)
- [Miguieles-on-mostow-rigidity-thm.pdf](#)
- [Benjy Firester thesis.pdf](#)
- [honoursthesis.pdf](#)
- [MostowMinicourse.pdf](#)
- <https://www.math.wustl.edu/~feres/mostow.pdf>
- <https://www.math.umd.edu/~bzh/On%20Mostow%20Rigidity%20Theorem.pdf>
  - [dg.differential geometry - Reference request: Geodesic flow on a manifold with negative curvature is ergodic - MathOverflow](#)
- [Berstein - seminar in topology, spring 2020 Mostow's rigidity theorem](#)
- [Topics in Topology: Rigidity theorems](#)
- [An invitation to rigidity theory.pdf](#)
- [Arithmeticity, superrigidity, and totally geodesic submanifolds - 10237548](#)
- [\[2208.05806v4\] Rigidity of Kleinian groups via self-joinings](#)
- [\[1702.00342v1\] A note on local rigidity](#)
- [The work of G. A. Margulis | SpringerLink](#)
- [HSjyvaskyla.pdf](#)
- [Lattices in semi-simple Lie groups - R'emi Boutonnet](#)
  - [https://www.math.u-bordeaux.fr/~rboutonnet/Lecture\\_notes\\_2019.pdf](https://www.math.u-bordeaux.fr/~rboutonnet/Lecture_notes_2019.pdf)
- [FIVE LECTURES ON LATTICES IN SEMISIMPLE LIE GROUPS by Yves Benoist](#)
- [Spectral Theory of Infinite-Area Hyperbolic Surfaces - David Borthwick - Google Books](#)

## historical papers on rigidity

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- [Eugenio Calabi, Edoardo Vesentini, 1960 - On Compact, Locally Symmetric Kähler Manifolds](#)

## Patterson-Sullivan measures

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- [Bowen-Margulis measure - Scholarpedia](#)
- [Dynamics of convex cocompact subgroups of mapping class groups - ProQuest](#)
- [Discrete isometry groups of symmetric spaces of noncompact type](#)
- [Patterson-Sullivan-Maß – Wikipedia](#)
- <https://de.wikipedia.org/wiki/Sullivan-Starrheit>
- [J F Quint - An overview of Patterson-Sullivan theory](#)
- [REF GGD GTG GGT AGT.rigidity](#)
- [Kingshook Biswas - Mostow rigidity](#)
- [Counting orbit points under group actions - Part 1 - Sayantan Khan's website](#)
- [Counting orbit points \(part 2\): Patterson-Sullivan theory - Sayantan Khan's website](#)
- [Riemann Surfaces, Dynamics and Geometry : Syllabus](#)
- [Mukherjee.pdf](#)
- <https://arxiv.org/pdf/2509.09924>
- <https://www.ams.org/books/memo/1539/memo1539.pdf>
- <https://arxiv.org/pdf/1111.0029>
- [https://scholar.google.com/scholar?start=50&q=patterson-sullivan+book&hl=en&as\\_sdt=0,5](https://scholar.google.com/scholar?start=50&q=patterson-sullivan+book&hl=en&as_sdt=0,5)
- [https://www.jstage.jst.go.jp/article/kodaimath/29/2/29\\_2\\_227/\\_pdf/-char/ja](https://www.jstage.jst.go.jp/article/kodaimath/29/2/29_2_227/_pdf/-char/ja)
- <https://helda.helsinki.fi/server/api/core/bitstreams/ec1a898a-4919-45ce-abc0-6d7ddc175eb4/content>
- [https://www.numdam.org/article/PMIHES\\_1979\\_\\_50\\_\\_171\\_0.pdf](https://www.numdam.org/article/PMIHES_1979__50__171_0.pdf)
- <https://www.math.stonybrook.edu/~dennis/publications/PDF/DS-pub-0062.pdf>
- <https://math.stackexchange.com/questions/1377213/describing-the-zero-level-set-of-a-harmonic-function>
- <https://mathoverflow.net/questions/131004/relation-between-volume-entropy-and-hausdorff-dim-of-limit-set>
- <https://hal.science/hal-02423338v1/document>
- [https://encyclopediaofmath.org/wiki/Busemann\\_function](https://encyclopediaofmath.org/wiki/Busemann_function)
- <https://www.math.ucdavis.edu/~kapovich/EPR/patterson-sullivan.pdf>
- <https://air.unimi.it/retrieve/1017692c-5f3e-4211-aab5-73ca19d69dc8/disk-poly-appeared2024-02-23.pdf>
- [https://archive.intlpress.com/site/pub/files/\\_fulltext/journals/cag/2003/0011/0005/CAG-2003-0011-0005-a007.pdf](https://archive.intlpress.com/site/pub/files/_fulltext/journals/cag/2003/0011/0005/CAG-2003-0011-0005-a007.pdf)
- [https://people.math.harvard.edu/~siu/math113/18\\_poisson\\_kernel.pdf](https://people.math.harvard.edu/~siu/math113/18_poisson_kernel.pdf)

- <https://math.stackexchange.com/questions/818447/positive-harmonic-function-with-harmonic-reciprocal-must-be-constant>
- <https://math.stackexchange.com/questions/4159071/busemann-function-and-its-relation-to-horocycle>
- [https://mathweb.ucsd.edu/~bdriver/231-02-03/Lecture\\_Notes/pde9.pdf](https://mathweb.ucsd.edu/~bdriver/231-02-03/Lecture_Notes/pde9.pdf)
- <https://math.stackexchange.com/questions/1348788/why-is-a-diffeomorphism-an-isometry-if-and-only-if-it-commutes-with-the-laplacia>
- <https://math.stackexchange.com/questions/4826/harmonic-function-composed-with-conformal-map-is-harmonic-in-mathbb{R}^n>
- <https://www.ams.org/notices/201109/rtx110901276p.pdf>
- <https://link.springer.com/article/10.1007/s002220050069>
- <https://gauss.math.yale.edu/~ho2/doc/Slices.pdf>
- [http://www.scholarpedia.org/article/Bowen-Margulis\\_measure](http://www.scholarpedia.org/article/Bowen-Margulis_measure)
- <https://www.math.wustl.edu/~feres/mostow.pdf>
- <https://sites.google.com/view/stationary-dynamics-course/home>
- <https://www.icts.res.in/sites/default/files/Peter-Shalen-1d.pdf>
- <https://www.icts.res.in/program/pmnc2021>
- <https://www.icts.res.in/program/pmnc2019>
- <https://www.icts.res.in/program/pmnc>

-  **The 2019 program involved random walks on hyperbolic spaces in the sense of Gromov, while the 2021 workshop stressed Patterson-Sullivan theory. A number of other aspects of hyperbolic geometry, including symbolic dynamics, circle packing and other random processes have become important across disciplines. We hope to cover some of these topics in the 2023 workshop.**

- <https://www.cambridge.org/core/journals/ergodic-theory-and-dynamical-systems/article/abs/minimal-entropy-and-mostows-rigidity-theorems/7B7F706676FAC80C728846B8A29AFF00>
- [https://www-users.cse.umn.edu/~garrett/m/mfms/notes\\_2013-14/11a\\_integration\\_on\\_quotes.pdf](https://www-users.cse.umn.edu/~garrett/m/mfms/notes_2013-14/11a_integration_on_quotes.pdf)
- <https://websites.umich.edu/~canary/CZZ3.pdf>
- <https://www.maths.gla.ac.uk/~mpowell/Migueles-on-mostow-rigidity-thm.pdf>
- <https://wiki.epfl.ch/grtr/documents/lucker2010.pdf>
- <https://www.youtube.com/watch?v=KtDkSusrV3U->
- (21) [Patterson--Sullivan densities in convex projective geometry 1 - YouTube](#)
- <https://sites.google.com/uic.edu/alex-furman/papers>
- [https://scholar.google.com/scholar?hl=en&as\\_sdt=2005&scioldt=0%2C5&cites=5255337840694624630&scipsc=1&q=book&b](https://scholar.google.com/scholar?hl=en&as_sdt=2005&scioldt=0%2C5&cites=5255337840694624630&scipsc=1&q=book&b)

tnG=

- [https://www.math.ucdavis.edu/~webfiles/dissertations/202003\\_Dey\\_Dissertation.pdf](https://www.math.ucdavis.edu/~webfiles/dissertations/202003_Dey_Dissertation.pdf)
- <https://www.its.caltech.edu/~matilde/SchottkyGroupsDenseFourier.pdf>
- [https://perso.imj-prg.fr/wp-content/uploads/sites/36/2023/05/Patterson\\_Sullivan\\_densities\\_are\\_stationary\\_measures\\_2.pdf](https://perso.imj-prg.fr/wp-content/uploads/sites/36/2023/05/Patterson_Sullivan_densities_are_stationary_measures_2.pdf)
- [https://gauss.math.yale.edu/~dk929/doc/papers/KimZimmer\\_boundary\\_rigidity.pdf](https://gauss.math.yale.edu/~dk929/doc/papers/KimZimmer_boundary_rigidity.pdf)
- <http://homepages.math.uic.edu/~friedlan/siegel.m.pdf>
- <https://www.jstor.org/stable/2661351?seq=1>
- <https://arxiv.org/pdf/2410.15476>
- [https://intlpress.com/site/pub/files/\\_fulltext/journals/cag/2005/0013/0003/CAG-2005-0013-0003-a004.pdf](https://intlpress.com/site/pub/files/_fulltext/journals/cag/2005/0013/0003/CAG-2005-0013-0003-a004.pdf)
- <https://sites.google.com/uic.edu/alex-furman/papers>
- random walk, Poisson
  - [poisson\\_boundary.pdf](#)
  - [Furstenberg's theorem on the Poisson boundaries of lattices of  \$SL\(n, \mathbb{R}\)\$  \(part I\) | Disquisitiones Mathematicae](#)
  - [Furstenberg's theorem on the Poisson boundaries of lattices of  \$SL\(n, \mathbb{R}\)\$  \(part II\) | Disquisitiones Mathematicae](#)
  - [The Poisson boundary of discrete subgroups of semisimple Lie groups without moment conditions - 2509.02500v2.pdf](#)
  - [whatis-furman.dvi - rtx110901276p.pdf](#)
  - [https://drive.google.com/file/d/14Pkg4GfcYRH81T7N\\_3W2bAZWaEZJCC2S/view](https://drive.google.com/file/d/14Pkg4GfcYRH81T7N_3W2bAZWaEZJCC2S/view)

## discrete subgroups

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- <https://mathweb.tifr.res.in/sites/default/files/publications/ln/tifr48.pdf>
- [Discrete subgroups of Lie groups and discrete transformation groups - lccs](#)
- computing discrete subgroups of products <https://mathoverflow.net/a/139534/562926>

## transformation groups

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- <https://www.mat.univie.ac.at/~michor/tgbook.pdf>
- [Tammo tom Dieck - Transformation Groups-De Gruyter \(1987\).pdf](#)
- [Transformation Groups and Representation Theory - Google Books](#)
- [Glen E Bredon - Introduction to compact transformation groups.pdf](#)
- [Shoshichi Kobayashi - Transformation Groups in Differential Geometry](#)
- [Graduate Course on the Dynamics and Structure of Transformation Groups | Fields Institute for Research in Mathematical Sciences](#) [#course](#)
- [An Introduction to Equivariant Cohomology\\_哔哩哔哩\\_bilibili](#)

- [Group actions on manifolds](#)

## **geometry of solvable groups**

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- [https://pi.math.cornell.edu/~riley/Teaching/Solvable\\_groups/The\\_Geometry\\_of\\_Solvable\\_Groups-Amin\\_Saied.pdf](https://pi.math.cornell.edu/~riley/Teaching/Solvable_groups/The_Geometry_of_Solvable_Groups-Amin_Saied.pdf) from [https://pi.math.cornell.edu/~riley/Teaching/Solvable\\_groups/index.html](https://pi.math.cornell.edu/~riley/Teaching/Solvable_groups/index.html)

## **hearing shape of a group**

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- <https://www.math.kyoto-u.ac.jp/~kfujiwara/shape.gp.pdf>

## **analytic group theory**

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- [\[2402.15867v1\] An Invitation to Analytic Group Theory](#)

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1. [2ndJuniorRetreatInterestsBooklet.pdf](#) ↔