

# CURRICULUM VITAE

**Prof. Dr. Marc Burger**

## PERSONAL DATA

### **Born:**

- 31.10.1959, in Neuchâtel, Switzerland, Swiss citizen

### **Education**

- Undergraduate studies at University of Lausanne, Switzerland, 1978–1982
- Licence ès Sciences Mathématiques, Lausanne 1982
- Diplôme de Mathématicien: “Sur les représentations de Weil des groupes Symplectiques”, Lausanne 1983
- Docteur ès Sciences: “Petites valeurs propres du laplacien et topologie de Fell” advisor: Prof. Dr. Derighetti, Lausanne, Mai 1986
- Habilitation: “Small eigenvalues of Riemann surfaces and graphs”, Basel 1990

### **Positions**

- Teaching assistant, Lausanne, 1983–1984
- Fellowship, “collaborateur scientifique” Swiss National Science Foundation, Lausanne, 1984–1986
- Teaching assistant, Basel, 1986–1989
- Postdoctoral fellowship, Swiss National Science Foundation, 1989–1991
- Invited assistant professor, Stanford, 1989–1990
- Institute for Advanced Study, member, 1990–1991
- Invited professor, CUNY Graduate Center, 1991–1992

- Professeur ordinaire, University of Lausanne, 1992–1997
- Full professor, ETH Zürich, since 1997
- Director of the "Forschungsinstitut für Mathematik", ETH Zürich, 1999 - 2009
- Member of the National Research Council of the Swiss National Science Foundation, since 2005, <http://www.snf.ch>

**Invitations (at least one week)**

- IMPA, Rio de Janeiro, September–October 1987
- Stanford, July 1988
- IHES, March–April 1989
- Göttingen, May–July 1991
- MSRI, Berkeley, January and June 1992
- Hebrew University, Jerusalem, March–April 1994
- Tata Institute, Bombay, February–March 1996
- IHES, February–March 1999
- Oberwolfach 1984, 1989, 1993, 1999, 2001, 2002, 2003, 2004
- Erwin Schrödinger Institute, July 2002, August and November 2002, March 2004, 2007, 2008
- Institut Fourier, Grenoble, Summer School, June - July 2004
- Institute for Advanced Study, September - December 2005
- Hausdorff Institut, Bonn, September - December 2009

**RESEARCH****Publications**

1. Analyse harmonique sur les groupes de Heisenberg généralisés, *Mh. Math.* 98 (1984), 29–40
2. (with B. Colbois) A propos de la multiplicité de la première valeur propre du laplacien d'une surface de Riemann, *C. R. Acad. Sc. Paris*, t.300, sér.I, no 8 (1985), 247–249
3. Petites valeurs propres du laplacien et topologie de Fell, Thèse, Lausanne 1986
4. Estimation de petites valeurs propres du laplacien d'un revêtement de variétés riemanniennes compactes, *C. R. Acad. Sc. Paris*, t.302, sér.I, no 5 (1986), 191–194
5. (with V. Schroeder) Amenable groups and stabilizers of measures on the boundary of a Hadamard manifold, *Math. Ann.* 276 (1986), 505–514
6. (with V. Schroeder) Volume, diameter and the first eigenvalue of locally symmetric spaces of rank one, *J. Diff. Geom.* 26 (1987), 273–284
7. (with P. Buser and J. Dodziuk) Riemann surfaces of large genus and large first eigenvalue; in: *Geometry and Analysis on Manifolds*, Lecture Notes in Math. 1339 (1988), 54–63
8. Spectre du laplacien, graphes et topologie de Fell, *Comm. Math. Helvetici* 63 (1988), 226–252
9. Asymptotics of small eigenvalues of Riemann surfaces, *Bull. of AMS*, 18, no 1 (1988), 39–40
10. Small eigenvalues of Riemann surfaces and graphs, *Math. Z.* 205 (1990), 395–420
11. Horocycle flow on geometrically finite surfaces, *Duke Math. J.* 61, no 3 (1990), 779–803
12. Kazhdan constants for  $SL(3, \mathbb{Z})$ , *J. reine angew. Math.* 413 (1991), 36–67
13. (with P. Sarnak) Ramanujan duals II, *Invent. Math.* 106 (1991), 1–11

14. (with J. S. Li and P. Sarnak) Ramanujan duals and automorphic spectrum, Bull. of AMS 26, no 2 (1992), 253–257
15. Intersection, the Manhattan curve, and Patterson–Sullivan theory in rank 2, Int. Math. Research Notices no 7 (1993), 217–225; in Duke Math. J. 71
16. (with N. A’Campo) Réseaux arithmétiques et commensurateur d’après G. A. Margulis, Invent. Math. 116 (1994), 1–25
17. (with D. Canary) A lower bound on the base eigenvalue for geometrically finite hyperbolic  $n$ -manifolds, J. reine angew. Math. 454 (1994), 37–57
18. Rigidity properties of group actions on  $CAT(0)$ -spaces, Proc. ICM Zürich, Switzerland 1994, 761-769; Birkhäuser 1995
19. (with S. Mozes)  $CAT(-1)$ -spaces, divergence groups and their commensurators, J. of the Amer. Math. Soc. 9, no 1 (1996), 57–93
20. (with P. de la Harpe) Constructing irreducible representations of discrete groups, Proc. Indian Acad. Sci. , Vol. 107, no 3, August (1997), 223–235
21. (with S. Mozes) Finitely presented simple groups and products of trees, C. R. Acad. Sci. Paris, t.324, Série I, (19 97), 747–752
22. (with A. Valette) Idempotents in complex group rings: theorems of Zalesskii and Bass revisited, J. of Lie Theory, Vol. 8, (1998), 219-228
23. (with N. Monod) Bounded cohomology of lattices in higher rank Lie groups, J. Eur. Math. Soc.1, (1999), 199–235
24. (with N. Monod) Bounded cohomology of lattices in higher rank Lie groups, Erratum, J. Eur. Math. Soc.1, (1999), 338
25. (with S. Mozes) Groups acting on trees: from local to global structure, Publ. Math. IHES 92 (2000), 113–150
26. (with S. Mozes) Lattices in product of trees, Publ. Math. IHES 92 (2000), 151–194
27. (with T. Gelander, A. Lubotzky and S. Mozes) Counting Hyperbolic Manifolds, GAFA 12 (2002) 1161–1173
28. (with N. Monod) Continuous bounded cohomology and applications to rigidity theory, GAFA 12 (2002), 219–280

29. (with A. Iozzi) Boundary maps in bounded cohomology, *GAF*A 12 (2002), 281–292
30. (with N. Monod) On and around the bounded cohomology of  $SL(2, \mathbb{R})$ , in “Rigidity in Dynamics and Geometry”, M. Burger and A. Iozzi eds., Springer 2002, pp. 19–37
31. (with A. Iozzi and A. Wienhard) Surface group representations with maximal Toledo invariant, *C.R. Acad. Sci. Paris, Ser. I* 336 (2003), 387–390
32. (with A. Iozzi) Bounded Kähler class rigidity of actions on hermitian symmetric spaces, *Ann. Scient. Éc. Norm. Sup. 4<sup>e</sup> série*, t. 37 (2004), 77–103
33. (with A. Iozzi and N. Monod) Equivariant embeddings of trees into hyperbolic spaces, *Intern. Math. Research Notices*, No. 22 (2005), 1331–1369
34. (with A. Iozzi, F. Labourie and A. Wienhard) Maximal representations of surface groups: symplectic Anosov structures, *Pure Appl. Math. Q.* 1 (2005), no. 3, part 2, 543–590.
35. (with A. Iozzi) Bounded differential forms, generalized Milnor-Wood inequality and an application to deformation rigidity. *Geom. Dedicata* 125(2007), 1–23.
36. (with A. Iozzi and A. Wienhard) Hermitian symmetric spaces and Kähler rigidity. *Transform. Groups* 12 (2007), no. 1, 5–32.
37. (with A. Iozzi) A measurable Cartan theorem and applications to deformation rigidity in complex hyperbolic geometry. *Pure Appl. Math. Q.* 4 (2008), no. 1, part 2, 181–202.
38. (with A. Iozzi and A. Wienhard) Tight Homomorphisms and Hermitian symmetric spaces, *Geom. Funct. Anal. Vol.* 19 (2009) 678–721.
39. (S. Mozes and Robert J. Zimmer) Linear Representations and Arithmeticity of Lattices in Products of Trees, *Proc. Inst. Wrk.shps. Int. Conf. - Essays in Geometric Group Theory No. 9*, 2009, pp. 1–25.
40. (with A. Iozzi and A. Wienhard) Surface group representations with maximal Toledo invariant, to appear in: *Annals of Math.* 2010.

**Preprints**

1. (with A. Iozzi) Bounded cohomology and totally real subspaces in complex hyperbolic geometry, preprint, 2001, <http://www.math.ethz.ch/~iozzi/ann-def.pdf>
2. (with A. Iozzi) Bounded cohomology and representation varieties of lattices in  $PSU(1,n)$ , preprint announcement, 2001, <http://www.math.ethz.ch/~iozzi/tr.pdf>
3. (with S. Mozes and R. Zimmer) Linear representations and arithmeticity of lattices in products of trees 2004, <http://www.fim.math.ethz.ch/preprints/2004/burger-mozes-zimmer.pdf>

**In Preparation**

1. (with J.S. Li and P. Sarnak) Ramanujan duals and automorphic spectrum, III.
2. (with A. Thom and N. Ozawa) On Ulam stability.

**Books**

1. (with J. Amorós, K. Corlette, D. Kotschick, D. Toledo) Fundamental groups of compact Kähler manifolds, Mathematical Surveys and Monographs, Vol. 44, AMS April 1996
2. “Rigidity in Dynamics and Geometry”, Proceedings of the conference at the Newton Institute, Cambridge, UK, March 2000, M. Burger and A. Iozzi eds., Springer 2002

## ACTIVITIES

### **Selected Recent Lectures, Minicourses and Courses**

- Lectures given in the Borel Seminars 1986, 1987, 1988, 1989, 1993 (affine symmetric spaces), 1995 ( $L^2$ -cohomology of Kähler groups)
- “Géométrie hyperbolique”, graduate course given at the 3ème cycle Romand, 1992-1993, Lausanne.
- ”Arithmetic and geometry of hyperbolic manifolds”, lecture given at the annual meeting of the SMS, 23.09.1993, Verbier.
- “Le théorème de Fermat”, seminar given at the 3ème cycle Romand, 1993-1994, lectures on Eichler–Shimura theory.
- ”Locally compact groups, commensurators of subgroups and rigidity properties of associated group actions”, invited 45 min. address, ICM 1994, Zürich.
- ”The work of Marina Ratner”, Laudatio and lecture given on the occasion of the award of the Ostrowski Prize to Marina Ratner, 8.8.1994, Basel.
- “Metrische Räume negativer Krümmung”, Nachdiplomvorlesung ETH Zürich, Wintersemester 1994–1995.
- “Cohomologie  $L^2$ ”, lectures given at the 3ème cycle Romand, with P. de la Harpe (Geneva) and A. Valette (Neuchâtel), 1994–1995.
- ”Rigidity properties of group actions on metric spaces of negative curvature”, 22.06.1995, Conference in honour of the retirement of Prof. Dr. H. Grauert, 19–23 June 1995, Göttingen.
- “Rigidity and Arithmeticity”, course given at the “European School of Group Theory”, September. 2–14, 1996, Schloss Hirschberg, Germany.
- “Analytic  $p$ -adic groups” graduate course, 3ème cycles Romand, 1996–1997.
- ”Lattices and products of trees”, 21.11.1997, ”Prospects in Geometry”, Max Planck Institut, Leipzig, 20–22. November 1997.
- ”On the bounded cohomology of higher rank lattices”, 16.06.1998 in ”Rigidité, représentations et théorie ergodique”, Université Paris VII, 15–20 June 1998.

- "Product of trees and simple groups", 1.10.1998, in "Representation theory and applications", Luminy, CIRM, 29.09.–2.10.1998.
- Einführungsvorlesung, ETH Zürich, 14.12.1998, "Gruppen als geometrische Objekte".
- Course given at the Euroconference, "Groups of tree automorphisms and lattices", Crete, 24-30 July, 1999.
- "Bounded cohomology of lattices in semisimple groups", Princeton University, 8.10.1999.
- "Bounded cohomology of lattices in semisimple groups", University of Maryland, 11.10.1999.
- "Cohomological aspects of lattices and applications to products of trees", 10.–14.1.2000, introductory lecture series to the special semester on "Ergodic Theory, Geometric Rigidity and Number Theory" at the Newton Institute, Cambridge.
- "Bounded cohomology and applications to lattices", 28.2.2000 in the Euroworkshop "Rigidity in Dynamics and Geometry", 27.–31.03.2000 Newton Institute, Cambridge.
- "Bounded cohomology: a survey", 4.7.2000 in the workshop "Ergodic Theory, Riemannian Geometry and Number Theory", 3.–7.7.2000 Newton Institute, Cambridge.
- "Introduction to bounded cohomology" series of lectures given at the Center for Dynamical Systems, Penn State University, College Park, 1.–14.10.2000.
- "Bounded cohomology and applications", 29.1.2001. Meeting Oberwolfach, "Topologische Methoden in der Gruppentheorie", 28.1.–3.2.2001.
- "Bounded cohomology and rigidity theory", 11.07.2001, Erwin Schrödinger Institut, Wien.
- "Bounded cohomology: an introduction" in "Géométrie et dynamique des groupes", Centre International de Rencontres Mathématiques, Luminy, France, 16.7.2002.
- "Cohomologie bornée: un panorama", Institut de Recherche Mathématique Avancée, Strasbourg, France, 3.6.2002.

- "Bounded cohomology: a panorama", Erwin Schrödinger Institut, Wien, 5.11.2002.
- "Bounded Cohomology and Group Actions" 03.06.2003, in "Combinatorics, dynamics and geometry of groups", 1.–6.6.2003, Gaeta, Italy.
- "Bounded Cohomology and Applications to Group Actions I", 13.07.2003 in "Geometry and Cohomology in Group Theory", 4.–14.7.2003, Durham U.K.
- "Groupes de Surface, nombre de Toledo et espaces symétriques hermitiens", 10.12.2003, Institut Fourier, Grenoble, France.
- "Bounded cohomology and group actions on hermitian symmetric spaces" (with A. Iozzi) minicourse given at the Summer School June 14 – July 2, 2004, Institut Fourier, Grenoble: "Non-positively curved geometries, discrete groups and rigidities".
- "Bounded cohomology and hermitian symmetric spaces" , CUNY, Graduate Center, 15.02.05.
- "Lattices acting on products of trees, old and new", CUNY, Graduate Center, 18.02.05.
- "Minicourse on "Bounded cohomology and hermitian symmetric spaces" in the conference "Bounded cohomology, harmonic maps and Higgs bundles", Strasbourg and Basel, 14.–19. March 2005.
- "Représentations maximales de groupes de surface: flots d'Anosov symplectiques", IRMA, Strasbourg, 13.06.05.
- "Maximal representations and symplectic Anosov structures" in "Asymptotic and probabilistic methods in geometric group theory", Genève, 20.–25.06.05.

### PhD Students

- Paul Albuquerque: "Mesures de Patterson-Sullivan dans les espaces symétriques de rang supérieur", 22.05.1997, University of Geneva, appeared as "Patterson-Sullivan theory in higher rank symmetric spaces" GAFA Vol. 9 (1999) 1–28.
- Nicolas Monod: "Continuous bounded cohomology of locally compact groups", 19.01.2001, ETH Zürich, appeared as Springer Lecture Notes 1758.

- Indira Chatterji (codirected with A. Valette): "On property (RD) for certain discrete groups", 07.09.2001, ETH Zürich, appeared as "On property RD for cocompact lattices in a finite product of rank one Lie groups with some rank two Lie groups" *Geometriae Dedicata* 96 (2003), 161–177.
- Olivier Amann: "Groups of tree-automorphisms and their unitary representations", 09.10.2003, ETH Zürich.
- Diego Rattaggi: "Computations in groups acting on a product of trees: normal subgroup structures and quaternion lattices", 06.05.2004, ETH Zürich.
- Michelle Bucher: "Characteristic classes and bounded cohomology", 09.07.2004, ETH Zürich.
- Theo Bühler: "On the algebraic foundation of bounded cohomology", 29.01.2008, ETH Zürich.

### **Current PhD students**

- Thomas Huber, ETH
- Jürg Portmann, ETH
- Tobias Strubel, ETH
- Valerio Gianella, ETH

### **Thesis and Habilitation coreferee**

- "Volume minimal et rigidité différentielle", Laurent Bessières; thèse, Université Paul Sabatier, Toulouse, direction Prof. Michel Boileau, soutenue le 17.01.1998.
- "Packungen im allgemeinen", A. Meier, Dissertation, Universität Basel, Leitung Prof. Norbert A'Campo, 30.01.1998.
- "Groupes et espaces hyperboliques", Michel Coornaert, habilitation, Université Louis Pasteur, Strasbourg, soutenue le 13.06.1998.
- "Sur la géométrie du bord des espaces hyperboliques au sens de M. Gromov", M. Bourdon habilitation, Université Henri Poincaré, Nancy I, 15.01.1999.

- "Cycles géodésiques dans les variétés hyperboliques", N. Bergeron, thèse ENS Lyon, direction J.-P. Otal, 30.11.2000.
- "Sous groupes discrets des groupes de Lie semi-simples réels et p-adiques", J.-F. Quint, thèse ENS Paris, direction Y. Benoist, 23.11.2001.
- "Deformation spaces for affine crystallographic groups", O. Baues, habilitation ETH Zürich, 2001.
- "Arbes, groupes, quotients", D. Gaboriau, habilitation, ENS Lyon, 08.04.2002.
- "Hyperbolicity of the renormalization operator for critical  $C^r$  circle mappings", E. Voutaz, thesis ETH Zürich, 20.01.2002.
- "Sur les propriétés algébriques et géométriques des groupes de Kac-Moody", B. Bemy, habilitation, Institut Fourier, 10.12.2003.
- "Rigidité en géométrie et théorie des groupes", B. Klingler, habilitation, Ecole Normale Supérieure, Paris, 07.05.2004.

## Scientific Organization of Workshops and Lectures

### 1. Borel Seminars, Bern

- "Counting integer points on affine varieties", organized with D. Masser (Basel), 1993.
- "Fundamental groups of Kähler manifolds", organized with D. Kotschick (Basel), 1995.
- "Large scale structure of symmetric spaces", organized with P. de la Harpe (Geneva) and V. Schroeder (Univ. Zürich), 1996.

### 2. Workshops and Conferences

- "Counting integer points on affine varieties", 20.2.93, Lausanne.
- "Hyperbolic groups", DMV Seminar 3.10.93–10.10.93, Blaubeuren, Germany, organized with S.J. Patterson (Göttingen).
- "Nonpositive Curvature in Group Theory", 27.–28. Nov. 97, ETH Zürich.
- "Low Dimensional Dynamics", 25.–27. Nov. 98, ETH Zürich.
- "The Baum-Connes Conjecture", 4.–7. May 99, ETH Zürich.

- “Analysis on Singular Spaces”, 3.– 5. Nov. 99, ETH Zürich.
- “Cohomology of Arithmetic Groups”, 24.–26. Jan. 00, ETH Zürich.
- “Combinatorial Aspects of Random Matrix Models”, 14.–18. May, 2001, ETH Zürich.
- “From Dynamical Systems to PDEs”, in Memory of Jürgen Moser, 11.–15. June 2001.
- “Advances in Rigidity Theory”, 17.–22. June, 2002, ETH Zürich.
- “Metric Geometry in the Large”, 30.10–1.11.2002, ETH Zürich.
- “Topology and Robotics”, 23.6–28.6, 2003, ETH Zürich.
- “Mathematics in Zürich: from classical to postmodern”, 40th Anniversary of FIM, 6.–10. July, 2004.
- “Lie Groups: from Topology to Arithmetic” in memory of A. Borel, Zürich (June 29.–July 1.) and Geneva (July 4.–6.), 2005.

### **3. Nachdiplomvorlesungen and Minicourses at ETH Zürich**

- minicourse given by G.A. Margulis, 26.5.–4.6.1998
- Nachdiplomvorlesung, M. Boileau (Toulouse), “On Thurston’s geometrization theorem for 3-dimensional orbifolds”, WS 98/99
- Nachdiplomvorlesung, A. Valette (Neuchâtel), “Introduction to the Baum–Connes conjecture” SS 99
- Nachdiplomvorlesung, N. A’Campo (Basel), “Knoten und Singularitäten”, WS 99/00
- Nachdiplomvorlesung, J. Schwermer (Düsseldorf), “Arithmetic groups – geometric aspects”, WS 99/00
- B. Klingler (IHES), “Representations of fundamental groups of projective varieties and Higgs bundles”, 15.11–13.12.00
- John Nash (Princeton), “A very computational approach to the study of cooperative games”, June 14, 2001
- D. Krammer (Basel), “Introduction to Braid Groups”, 31.10–14.11.2001

- Nachdiplomvorlesung, A. Katok (Penn State), “Dynamics and ergodic theory of actions of higher-rank abelian groups”, SS 02
- Nachdiplomvorlesung, B. Kleiner (Ann Arbor), “Boundaries of Gromov hyperbolic groups”, WS 02/03
- Nachdiplomvorlesung, Y. Pesin (Penn State), “Stable ergodicity and partial hyperbolicity: fundamentals and recent advances”, SS 03
- Nachdiplomvorlesung, V. Kaimanovich (Rennes), “Boundaries of groups: geometric and probabilistic aspects”, SS 04
- J. Dupont (Aarhus), “Scissors congruences in spherical and hyperbolic geometry”, 28.4.04.

#### 4. Varia

- Seminar über “Differentialgeometrie”, with U. Lang, V. Schroeder, K. Voss; Wednesdays, 15.30 – 16.30, since October 1997.
- Arbeitsgemeinschaft UNI–ETH, Wednesdays, 14.00 – 15.00, since October 1997.

#### Memberships of Editorial Boards

- Inventiones Mathematicae, (1994–2005)
- Commentarii Mathematici Helvetici, (since 1997)
- International Mathematics Research Notices, (since 1995)
- Zürich Lectures in Advanced Mathematics, (2003–2004)

#### Committee work

- Member of the Scientific Committee of the European Post-Doctoral Institute
- Member of the Board of Trustees of the Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette
- Member of the Kuratorium of the Swiss Mathematical Society
- Heinz Hopf Kommission, ETH
- Kommission für das Nachdiplomstudium, ETH
- Member of the Zürich Graduate School board