

# Curriculum Vitae

## Bruno Martelli

### 1 Personal data

Born in Arezzo, Italy on April 9, 1973.

Full Professor at the Maths Department, Faculty of Science, University of Pisa, Largo Pontecorvo 5, 56126 Pisa.

E-mail: [martelli@dm.unipi.it](mailto:martelli@dm.unipi.it)

Web page: <http://www.dm.unipi.it/~martelli>

### 2 Positions and titles

1992. Member of the Italian team in the XXXIII International Maths Olympiads, Moscow.

1992/93 – 1995/96. Math Dept of Pisa, graduated *cum lode*, thesis *Invarianti di Turaev-Viro*, supervised by Carlo Petronio.

1992/93 – 1995/96. Scuola Normale Superiore of Pisa, graduated *cum laude*.

1996/97. Istituto Nazionale di Alta Matematica in Rome.

1997/98 – 2000/01. Math Dept of Florence, PhD thesis *Complexity of three-manifolds*, supervised by Carlo Petronio and Wolfgang Metzler.

2001/02. Math Dept of Pisa, Postdoctoral Fellowship.

2002/03. Applied Math Dept of Pisa, Postdoctoral Fellowship.

2004 – 2014. Math Dept of Pisa, Assistant Professor (Ricercatore) in geometry.

2015 – 2016. Math Dept of Pisa, Associate Professor in geometry.

2017 – now. Math Dept of Pisa. Full Professor in geometry.

### 3 Visiting periods

December 1994. École Normale of Paris.

October – December 1995. St. John's College, Oxford.

March – June 2000. Frankfurt.

March 2003. Austin (Texas).

March 2010. *Professeur invité*, Institut de Recherche Mathématique Avancée de Strasbourg.

March 2012. Institut Henri Poincaré (Paris).

May – June 2013. *Professeur invité*, Institut de Recherche Mathématique Avancée de Strasbourg.

May 2015. *Professeur invité*, Université Paul Sabatier, Toulouse

## 4 Teaching

### Courses

I have taught various courses (as a main teacher or as an assistant, mostly in geometry/topology but also in analysis and algebra) in Pisa at the following departments: Telecommunications Engineering, Physics, Maths, Computer Science. Details starting from 2003/04 available from

<http://www.dm.unipi.it/~martelli/didattica.html>

### Dissertations supervised

#### Degree dissertations

- 24 November 2006. Abramo Bertucco, *Curve tropicali*.
- 23 February 2007. Leone Slavich, *Decomposizione per somma connessa di 3-varietà*.
- 25 May 2007. Marco Golla, *Varietà tropicali*.
- 27 September 2007. Claudio Tamburrino, *Coomologia della grassmanniana*.
- 25 July 2008. Mario Luca Scarascia, *Il polinomio di Alexander*.
- 27 March 2009. Fabio Lilliu, *Teorema di normalizzazione e Riemann-Roch*.
- 24 July 2009, Marco Antognozzi, *Introduzione alla teoria di Morse*.
- 30 October 2009, Francesca Iezzi, *Il polinomio di Jones e i link alternati*.
- 26 March 2010. Daniele Celoria, *Costruzione di Pontryagin e gruppi di omotopia delle sfere*.
- 28 June 2010. Francesco Lin, *K-teoria complessa e invariante di Hopf*.
- 28 June 2010. Nicolas Matte Bon, *Foliazioni di 3-varietà in codimensione uno: il teorema di Novikov*.
- 30 September 2011. Omar Quilici, *Omologia singolare e grado topologico*.
- 15 June 2012. Fabio Gironella, *Foliazioni misurate su superfici e teoremi di classificazione*.
- 19 July 2013. Michele Ancona, *Coomologia di  $SO(n)$* .
- 19 July 2013. Elena Giorgi, *Le classi di Stiefel-Whitney*.
- 2 Dicembre 2013. Irene Barbensi, *Il teorema di Lickorish-Wallace*.
- 13 maggio 2016. Alessandro Terni, *Teoria di Morse*.
- 10 giugno 2016. Irene Filoscia, *Decomposizione di 3-varietà in fattori primi*

## Master dissertations

- 27 November 2009. Claudio Tamburrino, *L'omologia di Khovanov*.  
29 October 2010. Mario Scarascia, *Superfici quasi-geodetiche in 3-varietà iperboliche*.  
17 October 2014. Marco Antognozzi, *La caratterizzazione di Rivin dei poliedri iperboliche di volume finito*.  
16 Ottobre 2015. Giulio Belletti, *The generalized Witten asymptotics conjecture*.  
14 Ottobre 2016. Fabio Lilliu, *Immersioni di superfici in 3-varietà iperboliche chiuse*.

## PhD dissertations

- October 2011. Fionntan Roukema, *Dehn Surgery on the Minimally Twisted Five-Chain Link*.  
April 2014. Leone Slavich, *Hyperbolic 4-manifolds and 24-cells*.  
Ottobre 2016. Alessio Carrega, *Shadows and Quantum Invariants*.  
May 2017. Stefano Riolo, *Cone-manifolds and hyperbolic surgeries*.  
Ongoing, started 2015. Giulio Belletti.

## 5 Talks

### Conferences

- August 1997. “Encoding spines of 3-manifolds via o-graphs,”  
*Low-dimensional topology and combinatorial group theory*, Luttach (Italy).  
August 1999. “Tori and minimal spines of 3-manifolds,”  
*Low-dimensional topology and combinatorial group theory*, Chelyabinsk (Russia).  
30 July – 8 August 2001. “Complexity of 3-manifolds and decompositions along tori,”  
*Low-dimensional topology and combinatorial group theory*, Luttach (Italy).  
15-17 June 2002. “Complexity of 3-manifolds and decompositions along tori,”  
*AMS-UMI joint meeting*, Pisa, session on the topology of 3-manifolds.  
1-8 September 2002. “Riconoscere varietà ottenute con chirurgia di link in  $S^3$ ,”  
*Proprietà geometriche dell varietà reali e complesse: nuovi contributi italiani III*, Palermo.  
8-13 September 2003. “Complessità di  $n$ -varietà triangolabili,”  
*Congresso UMI*, Milan, session on the topology and geometry of manifolds.  
6-9 May 2004. “Complexity of PL  $n$ -manifolds,”  
*INTAS workshop on 3-manifolds*, Ederburg (Germany).  
23-27 February 2005. “Links, two-handles, and complexity of 4-manifolds,”  
*Workshop on 3-manifolds and complexity*, Cortona (Italy).  
16-19 June 2005. “2-polyhedra in 4-manifolds,”  
*AMS-DMV-ÖMG joint meeting*, Mainz, session on geometric topology & group theory.

- 20-24 June 2005. “Dehn surgery on links in 3-manifolds,”  
*Summer school and conference on geometry and topology of 3-Manifolds*, Trieste.
- 20-26 May 2007. “Complexity and decompositions of PL-manifolds,” *Braids and their ramifications*, Cortona.
- 6-11 Dicembre 2010. “Turaev-Viro representations of the mapping class groups,”  
*De Brun workshop*, Galway (Ireland).
- 29 Avril - 4 Mai 2012. “Stable complexity and simplicial volume of manifolds,”  
*Triangulations*, Oberwolfach (Germany).
- 25 June 2013. “From cubulations to cusped hyperbolic 4-manifolds,”  
*Low-dimensional topology and geometry in Toulouse*, Toulouse (France).
- 30 June – 2 July 2014. “Hyperbolic 4-manifolds constructed via right-angled polytopes,”  
*RSME-SCM-SEMA-SIMAI-UMI joint meeting*, Bilbao, session on geometric topology.
- 5 March – 7 March 2015. “Varietà iperboliche di dimensione 4,”  
*Varietà reali e complesse: geometria, topologia e analisi armonica*, SNS Pisa.
- 24-30 May 2015. “Quantum representations of the mapping class group”,  
*Chromatic and colored structures in geometry and statistical physics*, Cortona.
- 22-27 June 2015. “Constructing hyperbolic four-manifolds”,  
*New Perspectives on the Interplay between Discrete Groups in Low-Dimensional Topology and Arithmetic Lattices*, Oberwolfach.
- 27-31 July 2015. “An analytic family of representations for the mapping class group of punctured surfaces”,  
*New developments in TQFT*, QGM Aarhus.
- 29 August - 2 July 2016. “Hyperbolic Dehn filling in dimension four”,  
*1st joint meeting Brazil-Italy in mathematics*, IMPA Rio de Janeiro
- 18-22 September 2017. “Hyperbolic Dehn filling in dimension four”,  
*Geometric topology in low dimensions*, Warwick.
- 11-15 December 2017. “Shadow complexity of smooth closed four-manifolds”,  
*Computation in geometric topology*, Warwick.
- 12-16 February 2018. “Shadow complexity of smooth closed four-manifolds”,  
*Knotted embeddings in dimensions 3 and 4*, Luminy.

## Seminar talks

- March 2000 – June 2000 and February 2001. Various seminars on the complexity of 3-manifolds at the Math Dept in Frankfurt.
- 19 May 2009. “Complessità di varietà triangolabili,” Bologna Math Dept.
- 8 June 2009. “Ombres de Turaev sans sommets,” Strasbourg IRMA.
- 22 March 2010. “Epines 3-dimensionnelles de 4-variétés,” Strasbourg IRMA.
- 24 January 2011. “Turaev-Viro representations of the mapping class groups,” Strasbourg IRMA.

- 23 April 2013. “Une famille analytique de représentations pour le groupe modulaire,” Paris Jussieu.
- 6 May 2013. “Une famille analytique de représentations pour le groupe modulaire,” Strasbourg IRMA.
- 27 May 2013. “Quantum representations of mapping class groups,” Paris Orsay.
- 26 February 2014. “Combinatorial constructions of hyperbolic and Einstein four-manifolds,” MIT Boston.
- 27 February 2014. “Combinatorial constructions of hyperbolic and Einstein four-manifolds,” Brown University.
- 20 May 2014. “Constructions of hyperbolic manifolds from regular polytopes,” Fribourg (Switzerland)
- 5 May 2015. “Quelques constructions de variétés hyperboliques en dimension 4,” Toulouse.
- 16 November 2016, “Hyperbolic Dehn filling in dimension four,” Regensburg.
- 17 November 2016, “The geometrisation of three-manifolds,” Regensburg.
- 30 November 2016, “Hyperbolic cone-manifolds in dimension four,” Uppsala.
- 22 June 2017, “Geometrisation of three-manifolds,” Heidelberg.
- 27 November 2017, “Hyperbolic Dehn filling in dimension four,” Luxembourg.

## 6 Organizational activities

- 1994 – 1996. Member of the evaluation team of the italian mathematical olympiad.
- 2002 – today. Reviewer for MathSciNet and referee for various journals.
- June 2004 – June 2005. Coordinator of a GNSAGA/GNAMPA italian project entitled *Flusso di Ricci su 3-varietà* (Ricci flow on 3-manifolds).
- March 2011 – 2015. National coordinator of a FIRB italian project entitled *Geometry and topology of low-dimensional manifolds*, with a budget of 610.000 euros.
- June 2013. Main organizer of the INdAM workshop *Geometric topology in Cortona*, Cortona, 3-7 June 2013 and of the mini-workshop *Hyperbolic geometry and mapping class groups*, Pisa 12-13 June 2013.
- May 2014. Member of the scientific committee for the intensive month *Teichmüller theory and surfaces in 3-manifolds*, Centro De Giorgi (Pisa), 26 May 2014 - 20 June 2014.
- June 2016. Member of the organization committee for the two-weeks *School on Geometric Group Theory and Low-Dimensional Topology: Recent Connections and Advances*, ICTP Trieste, 23 may 2016 - 2 june 2016.
- June 2016. Coordinator of a PRA Pisa project, with a budget of 40.000 euros.
- June 2017. Main organizer of the INdAM workshop *Geometric topology in Cortona*, Cortona, 4-10 June 2017.

## References

### Books

- [1] B. MARTELLI, “An Introduction to Geometric Topology,” 480 pages, [http://www.dm.unipi.it/~martelli/geometric\\_topology.html](http://www.dm.unipi.it/~martelli/geometric_topology.html), CreateSpace Independent Publishing Platform, 2016.

### Papers

- [2] B. MARTELLI, *Minimal spines and geometric decompositions of closed 3-manifolds*, in “Low-dimensional topology and combinatorial group theory (Chelyabinsk 1999)”, Inst. of Math. of Nat. Acad. Sci. of Ukraine, Kiev.
- [3] B. MARTELLI – C. PETRONIO, *Three-manifolds having complexity at most 9*, Experimental Math. **10** (2001), 207-237.
- [4] B. MARTELLI – C. PETRONIO, *A new decomposition theorem for 3-manifolds*, Illinois J. Math. **46** (2002), 755-780.
- [5] R. FRIGERIO – B. MARTELLI – C. PETRONIO, *Complexity and Heegaard genus of an infinite class of compact 3-manifolds*, Pacific J. Math. **210** (2003), 283-298.
- [6] R. FRIGERIO – B. MARTELLI – C. PETRONIO, *Dehn filling of cusped hyperbolic 3-manifolds with geodesic boundary*, J. Diff. Geom. **64** (2003), 425-456.
- [7] G. AMENDOLA – B. MARTELLI, *Non-orientable 3-manifolds of small complexity*, Topol. Appl. **133** (2003), 157-178.
- [8] R. FRIGERIO – B. MARTELLI – C. PETRONIO, *Small hyperbolic 3-manifolds with geodesic boundary*, Experimental Math. **13** (2004), 177-190.
- [9] B. MARTELLI – C. PETRONIO, *Complexity of geometric three-manifolds*, Geom. Dedicata **108** (2004), 15-69.
- [10] G. AMENDOLA – B. MARTELLI, *Non-orientable 3-manifolds of complexity up to 7*, Topol. Appl. **150** (2005), 179-195.
- [11] B. MARTELLI *Links, two-handles, and four-manifolds*, Int. Math. Res. Not. **58** (2005), 3595-3624.
- [12] B. MARTELLI – C. PETRONIO, *Dehn filling of the “magic” 3-manifold*, Comm. Anal. Geom. **14** (2006), 967-1024.
- [13] B. MARTELLI *Complexity of 3-manifolds*, ”Spaces of Kleinian Groups”, London Math. Soc. Lec. Notes Ser. **329** (2006), 91-120.
- [14] R. FRIGERIO – B. MARTELLI, *Countable groups are mapping class groups of hyperbolic 3-manifolds* Math. Res. Lett. **13** (2006), 897-910.

- [15] F. COSTANTINO – R. FRIGERIO – B. MARTELLI – C. PETRONIO, *Triangulations of 3-manifolds, hyperbolic relative handlebodies, and Dehn filling*, Comm. Math. Helv. **82** (2007), 903-934.
- [16] E. FOMINYKH – B. MARTELLI, *k-Normal surfaces*, J. Diff. Geom. **82** (2009), 101-114.
- [17] D. HEARD – C. HODGSON – B. MARTELLI – C. PETRONIO, *Hyperbolic graphs of small complexity*, Experimental Math. **19** (2010), 211-236.
- [18] B. MARTELLI, *Complexity of PL manifolds*, Algebraic & Geometric Topology **10** (2010), 1107-1164.
- [19] B. MARTELLI, *Four-manifolds with shadow-complexity zero*, Int. Math. Res. Not. **2011** (2011), 1268-1351.
- [20] B. MARTELLI, *A finite set of local moves for Kirby calculus*, J. Knot Theory Ramif. **21** (2012), 1250126.
- [21] S. FRANCAVIGLIA – R. FRIGERIO – B. MARTELLI, *Stable complexity and simplicial volume of manifolds*, Journal of Topology **5** (2012), 977-1010.
- [22] A. KOLPAKOV – B. MARTELLI, *Hyperbolic four-manifolds with one cusp*, Geom. & Funct. Anal. **23** (2013), 1903-1933.
- [23] F. COSTANTINO – B. MARTELLI, *An analytic family of representations for the mapping class group of punctured surfaces*, Geometry & Topology **18** (2014) 1485-1538.
- [24] B. MARTELLI – C. PETRONIO – F. ROUKEMA, *Exceptional Dehn surgery on the minimally twisted five-chain link*, Comm. Anal. Geom. **22** (2014), 689-735.
- [25] A. KOLPAKOV – B. MARTELLI – S. TSCHANTZ, *Some hyperbolic three-manifolds that bound geometrically*, Proc. Amer. Math. Soc. **143** (2015), 4103-4111.
- [26] A. CARREGA – B. MARTELLI, *Shadows, ribbon surfaces, and quantum invariants*, Quantum Topology **8** (2017), 249-294.
- [27] B. MARTELLI – M. NOVAGA – A. PLUDA – S. RIOLO, *Spines of minimal length*, Ann. Sc. Norm. Sup. Pisa Cl. Sci **XVII** (2017), 1067-1090.
- [28] M. GOLLA – B. MARTELLI, *Pair of pants decomposition of 4-manifolds*, Algebraic & Geometric Topology, **17** (2017), 1407-1444.
- [29] B. MARTELLI, *Hyperbolic three-manifolds that embed geodesically*, arXiv:1510.06325.
- [30] B. MARTELLI, *Hyperbolic four-manifolds*, arXiv:1512.03661, submitted
- [31] B. MARTELLI – S. RIOLO, *Hyperbolic Dehn filling in dimension four*, arXiv:1608.08309, to appear in Geometry & Topology.

Pisa, February 2, 2018