

# Jean-Philippe Labbé

Institut für Mathematik  
Freie Universität Berlin  
Arnimallee 2, Berlin  
14195 Deutschland

labbe at math.fu-berlin.de  
<http://page.mi.fu-berlin.de/labbe>  
Phone: +49 30 838 75653

## Area of specialization

The focus of my research is at the intersection of group theory, discrete geometry and combinatorics. My area of specialization consists of combinatorial, geometric, and computational approaches to study algebraic and topological structures. My research deals with problems related to Coxeter groups, polytopes (in particular the permutahedra, associahedra and their generalizations), triangulations, and simplicial complexes.

## MSC2010 keywords:

Combinatorial aspects of groups and algebras, Reflection and Coxeter groups (05E15, 20F55)  
Combinatorial aspects and Stanley-Reisner face rings of simplicial complexes (05E45, 13F55)  
Combinatorial properties of polytopes, Special polytopes (52B05, 52B12)

## Employment

### Postdoctoral Research Fellow

Freie Universität Berlin  
SFB Transregio “Discretization in Geometry and Dynamics”

October 2016 - June 2020

Hebrew University of Jerusalem/Universidad de Cantabria

October 2014 - September 2016

Freie Universität Berlin  
SFB Transregio “Discretization in Geometry and Dynamics”

July 2013 - June 2014

### Teaching

Seminar Discrete Mathematics I (15 students, Bachelor-Master, FU Berlin) Winter Term 2017-18  
Discrete Mathematics I (45 students, Bachelor-Master, FU Berlin) Summer Term 2017

Algèbre II, Algèbre Matricielle, Combinatoire (Teaching Assistant, UQAM) September 2009 - April 2010

## Education

Dr. rer. nat., Mathematics, Freie Universität Berlin October 2010 - July 2013  
*Polyhedral Combinatorics of Coxeter Groups*  
Advisor: **Günter M. Ziegler** Reviewers: **Vic Reiner, Volkmar Welker**

Maîtrise ès Sciences, Mathématiques, Université du Québec à Montréal May 2008 - August 2010

### **Mention Honorable – Top Score Thesis**

*Combinatorial approach to clusters using sortable elements of Coxeter groups* [in French]  
Advisor: **Christophe Hohlweg** Reviewers: **Robert Bédard, Christophe Reutenauer**

Bachelier ès Sciences, Mathématiques September 2005 - April 2008  
Université Laval, Québec City  
Math in Moscow, Independent University of Moscow Fall 2007  
Budapest Semesters in Mathematics, St-Olaf College & Eötvös University Fall 2006

### Articles in preparation

16. J.-P. Labbé and C. Lange, *On the common vertices of permutahedra and generalized associahedra*, 22 pp.

### Preprints

15. J.-P. Labbé, G. Rote, and G. M. Ziegler, *Area difference bounds for dissections of a square into an odd number of triangles*, arxiv:1708.02891 (August 2017), 29 pp.
14. J.-P. Labbé and S. Labbé, *A Perron theorem for matrices with negative entries and applications to Coxeter groups*, submitted, arxiv:1511.04975 (November 2015), 14 pp.

### Publications

13. J.-P. Labbé and E. Nevo, *Upper bounds on entries of the  $\gamma$ -vectors for flag spheres*, to appear in SIAM J. Discrete Math. arxiv:1612.01169, (December 2016) 13 pp.
12. J.-P. Labbé, T. Manneville, and F. Santos, *Hirsch polytopes with exponentially long combinatorial segments*, in press, Math. Program. DOI: 10.1007/s10107-016-1099-y
11. H. Chen and J.-P. Labbé, *Limit directions for Lorentzian Coxeter systems*, Groups Geom. Dyn. **11** (2017), no. 2, 469–498.
10. S. B. Brodsky, C. Ceballos, and J.-P. Labbé, *Cluster Algebras of Type  $D_4$ , Tropical Planes, and the Positive Tropical Grassmannian*, Beitr. Algebra Geom. **58** (2017), no. 1, 25–46.
9. C. Hohlweg and J.-P. Labbé, *On inversion sets and the weak order in Coxeter groups*, European J. Combin. **55** (2016), 1–19.
8. N. Bergeron, C. Ceballos, and J.-P. Labbé, *Fan realizations of type A subword complexes and multi-associahedra of rank 3*, Discrete Comput. Geom. **54** (2015), no. 1, 195–231.
7. H. Chen and J.-P. Labbé, *Lorentzian Coxeter systems and Boyd–Maxwell ball packings*, Geom. Dedic. **174** (2015), no. 1, 43–73.
6. C. Hohlweg, J.-P. Labbé, and V. Ripoll, *Asymptotical behaviour of roots of infinite Coxeter groups*, Canad. J. Math. **66** (2014), no. 2, 323–353.
5. C. Ceballos, J.-P. Labbé, and C. Stump, *Subword complexes, cluster complexes, and generalized multi-associahedra*, J. of Alg. Comb. **39** (2014), no. 1, 17–51.
4. J.-P. Labbé and G. Labelle, *Counting types of runs in classes of arborescent words*, Open Journal of Discrete Mathematics **3** (2013), no. 1, 7–15.
3. S. Brlek, J.-P. Labbé, and M. Mendès France, *Combinatorial variations on Cantor’s diagonal*, J. Comb. Theory, Ser. A **119** (2012), no. 3, 655–667.

### Theses

2. J.-P. Labbé, *Polyhedral Combinatorics of Coxeter Groups*, Dissertation, Freie Universität Berlin, July 2013. [www.diss.fu-berlin.de/diss/receive/FUDISS.thesis.000000094753](http://www.diss.fu-berlin.de/diss/receive/FUDISS.thesis.000000094753)
1. J.-P. Labbé, *Combinatorial approach to clusters using sortable elements of Coxeter groups* [in French], Mémoire de maîtrise en mathématiques, UQAM, 2010, 105 p. [www.archipel.uqam.ca/3670/](http://www.archipel.uqam.ca/3670/)

### Honors, Awards and Grants

#### Fonds de recherche Nature et Technologies (Québec) – by Provincial Competition

Master, Doctoral, and Postdoctoral Research Fellowship

2008-10, 2010-13, 2015-16

#### Berlin Mathematical School

Phase II – Certificate of Distinction

October 2013

Public Prize for Best Talk – Math Slam (Sandwich Theory)

BMS Days February 2013

### Professional Services

<u>Referee</u> , (New York Journal of Mathematics, Experimental Mathematics, Israel Journal of Mathematics, Journal of Algebra, Discrete & Computational Geometry, Beiträge zur Algebra und Geometrie, Séminaire Lotharingien de Combinatoire, Discrete Mathematics, Australasian Journal of Combinatorics)	2011 -
<u>Organizer</u> , ( <b>Chair</b> ) <i>Sage Days 79</i> , Jerusalem	November 2016
<i>Berlin Mathematical School Student Conference</i>	February 2013
<i>Polyhedral Combinatorics Seminar</i> , Freie Universität Berlin	2011 - 2013
<i>Coxeter Groups meet Convex Geometry</i> , UQAM	August 2012
( <b>Chair</b> ) Québec's Provincial Graduate Student Conference (ISM)	2009
<u>Political representation</u> , ( <b>nominated</b> ) Postdoctoral representative, Berlin Mathematical School	2017
( <b>nominated</b> ) Postdoctoral spokesperson, Einstein Institute of Math.	2015-2016
( <b>elected</b> ) Student representative, Berlin Mathematical School	2012
Member: BMS Executive Board, Admission committee, and Mentoring, Gender and Diversity committee	
( <b>elected</b> ) Vice-president, Department Student Association, Université Laval	2006-07
( <b>elected</b> ) Student representative, Department Student Association, Université Laval	2005-06
<u>Ambassador</u> , Centre d'étude Collégial, Lac-Mégantic (Québec)	2011 -
<u>Programmer</u> , <i>Sagemath</i> , <i>Open Source Computer Algebra System</i>	2010 -

### Selected Conferences

<u>Sagemath Coding Sprint</u>	
University of Minnesota, Minneapolis, USA	August 2017
• <b>Talk</b> on <i>Experimental Coxeter Group Theory</i>	
<u>Encuentro Colombiano de Combinatoria 2016</u>	
Medellín, Colombia	June 2016
• <b>Talk</b> on <i>Introduction to Subword Complexes of Coxeter Groups</i>	
<u>EACA International School on Computer Algebra and its Applications 2016</u>	
Sevilla, Spain	January 2016
• <b>Talk</b> on <i>Bounding the discrepancy of odd-equal triangulations of the square</i>	
<u>Discretization in Geometry and Dynamics</u>	
Conference, Herrsching am Ammersee, Germany	October 2015
• <b>Talk</b> on <i>Bounding the discrepancy of odd-equal triangulations of the square</i>	
<u>Algebraic and Geometric Combinatorics</u>	
Mathematisches Forschungsinstitut Oberwolfach, Germany	February 2015
<u>FPSAC International Conference</u>	
KAIST, Daejeon, Korea	July 2015
• <b>Poster</b> on <i>Fan realizations of multiassociahedron</i>	
DePaul University, Chicago, USA	July 2014
• <b>Poster</b> on <i>Lorentzian Coxeter systems &amp; Boyd–Maxwell ball packings</i>	
University of Nagoya, Japan	August 2012
• <b>Talk</b> on <i>Multi-Cluster Complexes</i>	
• <b>Talk</b> on <i>Asymptotical behaviour of roots of infinite Coxeter groups</i>	
<u>Seminar on Combinatorics of words</u>	
Centre International de Rencontres Mathématiques, Luminy, France	May 2010
• <b>Guest speaker</b> , <i>Seminar on Cantorian tableaux</i>	

## References

### **Günter M. Ziegler (PhD Advisor)**

Institut für Mathematik  
Freie Universität Berlin  
Arnimallee 2,  
D-14195 Berlin Germany

### **Christophe Hohlweg**

Département de Mathématiques - LaCIM  
Université du Québec à Montréal  
CP 8888 Succ. Centre-Ville Montréal  
Québec H3C 3P8 Canada

### **Victor Reiner**

School of Mathematics  
University of Minnesota  
Minneapolis, MN 55455 (USA)

### **Volkmar Welker**

Philipps-Universität Marburg  
Fachbereich Mathematik und Informatik  
Hans-Meerwein-Strasse D-35032 Marburg, Germany

### **Eran Nevo**

Institute of Mathematics  
Hebrew University  
Givat Ram, Jerusalem 91904, Israel

### **Francisco Santos**

Departamento de Matemáticas, Estadística y Computación  
Universidad de Cantabria  
Av. de los Castros 48, E-39005 Santander, Spain

## Interests

### Languages

French:	Native speaker	English:	Fluent	German:	Advanced
Russian:	Moscow Pushkin Institute (Beginner) McGill University (Advanced 2)	Spanish:	Intermediate	Hebrew:	Beginner
Hungarian:	Budapest Semesters (Beginner)				

### Cycling

- Constructed three single-speed bikes
- Cyclo-camping: Québec City – Îles-de-la-Madeleine (June 2009 – 1200km in 7 days)
- Race: Vélothon Berlin 2012 (60km in 1h38min12sec)

### Other

Rock climbing	Ultimate frisbee	French poetry
Theater of the Absurd	Progressive rock	Pencil drawing