

Benedikt Kolbe

Email: benedikt.kolbe@inria.fr

Education and Experience

- 10/2019 – current **Postdoctoral position at INRIA, Nancy, France**
- 10/2015 – 10/2019 **PhD in mathematics - Technical University in Berlin, Australian National University**
Thesis title: Structures in three-dimensional Euclidean space from hyperbolic tilings
The work produced a method for an exhaustive enumeration of entangled graphs in \mathbb{R}^3 embedded as tilings of triply periodic minimal surfaces. In the process, a classification of isotopy classes of tilings with a given symmetry group of hyperbolic surfaces was developed. In addition, combinatorial tiling theory was generalized to account for Euclidean and hyperbolic tilings with unbounded and non-simply connected tiles.
Related topics: Subgroups of mapping class groups of orbifolds and braid groups, computational group theory, orbifolds, differential geometry of surfaces and ideal knot shapes, knot theory, combinatorial tiling theory, Teichmüller spaces, (discrete) conformal mappings, minimal surface theory, physical and chemical aspects of structure formation.
Included two research stays at the Australian National University, each for a period of 3 months, with Vanessa Robins, financed through a scholarship granted by the DAAD.
Supervised by Myfanwy Evans and John Sullivan.
- 10/2008 – 07/2015 **Mathematics - Humboldt-University in Berlin**
Major in mathematics with minor in Chemistry. Later specialisation: Differential geometry. Additional coursework in other specialisations: Theory of PDEs, semi-groups; logic and model theory.
Diploma grade: 1.4. Thesis title: Ricci Solitons and the Bracket flow.
Aim of the thesis was to analyse the Ricci flow on homogeneous manifolds and provide an alternative description of its evolution with the bracket flow. For this, several types of convergence of (homogeneous) manifolds were analysed and some structural results were ascertained. The resulting evolution equations of the most important curvature quantities under the bracket flow were studied and the obtained results were used to investigate the Alekseevski conjecture. Supervisors: Helga Baum and Dorothee Schueth
- 10/2009 – 07/2015 **Physics - Humboldt-University in Berlin**
Major in physics. Later specialisation: Quantum field theory, elementary particle physics.
Bachelor in physics (03/2014). Grade: 1.5. Thesis title: Conformal Transformations of massless free fields.
Aim of the thesis was to construct a non-standard representation of the conformal group of compactified 4-dimensional Minkowski space-time suited for quantisations. Roughly, this was achieved by studying representations induced by isotropy representations and by considering representations of covering groups induced by representations of their Lie algebras. Supervisor: Matthias Staudacher
- 09/2011 – 09/2012 **Japanese and Philosophy - Waseda University in Tokyo, Japan**
Subsidised by both a scholarship of the Humboldt-University and the Japanese government. Senior thesis in physics. Thesis title: Metrics in general relativity theory. Written in Japanese under Satoshi Inaba
- 10/2007 – 10/2008 **Work and Travel in Australia**

- 08/2003 – 08/2004 **Oakland High School in Oakland, Oregon, USA**
Student exchange program, graduated with: High School Diploma
- 08/1999 – 08/2007 **Schiller Gynnasium in Berlin**
Bilingual English-German, graduated with: Abitur
- 1996 – 1999 **Charles-Dickens elementary school in Berlin**
Bilingual English-German
- 1993 – 1996 **Shanghai International School in Shanghai, China**
Bilingual Chinese-English

Computer Skills

Several years experience with Linux systems (Ubuntu and OpenSUSE)

Knowledge of programming languages: Java, Matlab, GAP and Python.

Proficient in \LaTeX .

Languages

German and English both at native level

Japanese: fluent (reading, speaking); intermediate (writing)

French: fluent

Chinese: intermediate (reading, speaking); basic (writing)

Other Experience

- 01/2017 – 09/2019 Teaching assistant at the Technical University Berlin, in different groups in stochastics, measure theory
- 06/2013 – 10/2015 Tutor in M. Staudacher's research group at Humboldt-University
- 05/2016 – 09/2016 Paternity leave
- 06/2018 – 09/2018 Paternity leave
- 01/2019 – 03/2019 Paternity leave

Hobbies and interests

Study of music, specifically the piano and guitar, travelling, child psychology

Publications and preprints

Marcel Padilla, [Benedikt Kolbe](#), Aniruddha Chakraborty: The Nearest Hermitian Inverse Eigenvalue Problem Solution with Respect to the 2-Norm. In: arXiv:1703.00829 [math.NA] (2017)

[Benedikt Kolbe](#), Myfanwy Evans: Isotopic tiling theory for hyperbolic surfaces. arXiv:1808.00721 [math.GT] (2018) (Accepted to be published in Geometriae Dedicata)

[Benedikt Kolbe](#), Myfanwy Evans: Enumerating Isotopy Classes of Tilings guided by the symmetry of Triply-Periodic Minimal Surfaces. arXiv:1808.00984 [math.GT](2018) (Submitted to SIAM Journal on Applied Algebra and Geometry - under review)

[Benedikt Kolbe](#), Vanessa Robins: Tiling the Euclidean and Hyperbolic planes with ribbons. arXiv:1904.03788 [math.GT](2019) (Submitted to Geometriae Dedicata - under review)

Talks and Contributions

Accepted talk at Structure of Materials conference, Berlin. Title: Enumerations of 3-periodic nets with rotational symmetry on triply-periodic minimal surfaces. March 25th 2020

Accepted talk at EuroCG 2020, Wuerzburg. Title: Enumerating isotopy classes of tilings of triply-periodic minimal surfaces. March 17th 2020

Invited talk in Groeningen. Title: Restrictions on Delaunay triangulations of hyperbolic surfaces. February 18th 2020

Invited talk at INRIA, Nancy. Title: Structures in three-dimensional Euclidean space from hyperbolic tilings (December 11th 2019)

Invited Talk at the Research School of Physics and Engineering, Australian National University. Title: Entangled Nets from Surface Drawings. November 10th 2017

PhD defense, Technical University Berlin, Berlin. Title: Structures in three-dimensional Euclidean space from hyperbolic tilings. October 18th 2019

Seminar talk at the Technical University of Berlin, Berlin, October 11th 2019. Title: Periodic nets in three-dimensional Euclidean space from hyperbolic tilings.

Poster presentation at the DPG spring conference in Berlin. March 12th 2018

Invited Talk at the 6th Student Conference of the Berlin Mathematical School. Title: Entangled Nets from Surface Drawings. February 22nd 2018

I held a seminar on my work on tilings and mapping class groups held at the Department of Applied Mathematics, Australian National University, bi-weekly from October - December 2017. Participants included: Stephen Hyde, Stuart Ramsden, Olaf Delgado-Friedrichs, Vanessa Robins, Martin Cramer Pedersen.

Contributed Talk at the DPG (German Physical Society) spring conference. Title: Three-Dimensional Nets from Hyperbolic Tilings. March 23rd 2017

Seminar talk at the Technical University of Berlin, Berlin, March 27th 2017. Title: Knots, minimal surfaces, mapping class groups.

Poster presentation at the Boden Research conference 'Animal, Vegetal, Mineral', Yallingup / Western Australia, 19 – 23 September 2016.

Seminar talk at the Technical University of Berlin, Berlin, July 27th 2016. Title: Crystalline structures from hyperbolic tilings.