

# Marc Kegel

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## Personal

- Born on June 29, 1987 in Cologne.
- German citizen.

## Research Interests

- **Geometric topology:** low dimensional topology, experimental mathematics, knot theory, 3-manifolds, smooth 4-manifolds, Dehn surgery, open books, Kirby calculus, Lefschetz fibrations, trisections and Heegaard splittings.
- **Differential topology:** contact and symplectic geometry, Legendrian and transverse knot theory, Engel structures, Morse theory, hyperbolic geometry.

## Publications

### Submitted articles:

- (27) S. Bastl, R. Burke, R. Chatterjee, S. Dey, A. Durst, S. Friedl, D. Galvin, A. García Rivas, T. Hirsch, C. Hobohm, C.-S. Hsueh, M. Kegel, F. Kern, S. M. S. Lee, C. Löh, N. Manikandan, L. Mousseau, L. Munser, M. Pencovitch, P. Perras, M. Powell, J. P. Quintanilha, L. Schambeck, D. Suchodoll, M. Tancer, A. Thiele, P. Truöl, M. Uschold, S. Veselá, M. Weiß, M. von Wunsch-Rolshoven, *Algorithms in 4-manifold topology*, arXiv:2411.08775, 24 pages, submitted.
- (26) K. Baker, M. Kegel and D. McCoy, *The search for alternating surgeries*, arXiv:2409.09842, 67 pages, submitted.
- (25) K. Baker, M. Kegel and D. McCoy, *Quasi-alternating surgeries*, arXiv:2409.09839, 28 pages, submitted.
- (24) K. Baker, M. Kegel and D. McCoy, *Two curious strongly invertible L-space knots*, arXiv:2409.09833, 12 pages, submitted.
- (23) R. Chatterjee and M. Kegel, *Contact surgery numbers of  $\Sigma(2,3,11)$  and  $L(4m+3,4)$* , arXiv:2404.18177, 30 pages, submitted.
- (22) M. Kegel, A. Ray, J. Spreer, E. Thompson, and S. Tillmann, *On a volume invariant of 3-manifolds*, arXiv:2402.04839, 26 pages, submitted.
- (21) M. Kegel and N. Weiss, *Complexity of equal 0-surgeries*, arXiv:2401.06015, 13 pages, submitted.
- (20) M. Kegel, N. Manikandan, L. Mousseau, and M. Silvero, *Khovanov homology of positive links and of L-space knots*, arXiv:2304.13613, 25 pages, submitted.

### Articles accepted for publication:

- (19) M. Kegel, L. Lewark, N. Manikandan, F. Misev, L. Mousseau, and M. Silvero, *On unknotting fibered positive knots and braids*, [arXiv:2312.07339](#), 17 pages, to appear in *Ann. Sc. Norm. Super. Pisa Cl. Sci.*
- (18) M. Kegel and F. Schmäschke, *Trisecting a 4-dimensional book into three chapters*, [arXiv:2304.12250](#), 29 pages, to appear in *Geom. Dedicata*.

### Published articles:

- (17) R. Casals, J. Etnyre, and M. Kegel, *Stein traces and characterizing slopes*, *Math. Ann.* **389** (2024), 1053–1098.
- (16) J. Etnyre, M. Kegel, and S. Onaran, *Contact surgery numbers*, *J. Symplectic Geom.* **21** (2023), 1255–1333.
- (15) M. Kegel, *Non-isotopic transverse tori in Engel manifolds*, *Rev. Mat. Iberoamericana* **40** (2024), 43–56.
- (14) K. Baker and M. Kegel, *Census  $L$ -space knots are braid positive, except for one that is not*, *Algebr. Geom. Topol.*, **24** (2024), 569–586.
- (13) F. Ayaz, M. Kegel, and K. Mohnke, *The classification of surfaces via normal curves*, *Jahresber. Dtsch. Math.-Ver.*, **125** (2023), 121–134.
- (12) C. Anderson, K. Baker, X. Gao, M. Kegel, K. Le, K. Miller, S. Onaran, G. Sangston, S. Tripp, A. Wood, and A. Wright,  *$L$ -space knots with tunnel number  $>1$  by experiment*, *Exp. Math.*, **32** (2023), 600–614.
- (11) M. Kegel and S. Onaran, *Contact surgery graphs*, *Bull. Aust. Math. Soc.*, **107** (2023), 146–157.
- (10) S. Durst, M. Kegel, and J. Licata, *Rotation numbers and the Euler class in open books*, *Michigan Math. J.*, **70** (2021), 869–888.
- (9) M. Kegel and C. Lange, *A Boothby–Wang theorem for Besse contact manifolds*, *Arnold Math. J.*, **7** (2021), 225–241.
- (8) S. Durst, H. Geiges, J. Gonzalo, and M. Kegel, *Parallelisability of 3-manifolds via surgery*, *Expo. Math.*, **38** (2020), 131–137.
- (7) M. Kegel, J. Schneider, and K. Zehmisch, *Symplectic dynamics and the 3-sphere*, *Israel J. Math.*, **235** (2020), 245–254.
- (6) S. Durst, H. Geiges, and M. Kegel, *Handle homology of manifolds*, *Topology Appl.*, **256** (2019), 113–127.
- (5) M. Kegel, *Cosmetic contact surgeries along transverse knots and the knot complement problem*, *Topology Appl.*, **256** (2019), 46–59.
- (4) S. Durst and M. Kegel, *Computing rotation numbers in open books*, *J. Gökova Geom. Topol. GGT* **12** (2018), 71–92.
- (3) M. Kegel, *The Legendrian knot complement problem*, *J. Knot Theory Ramifications*, **27** (2018), 1850067, 36 pages.
- (2) S. Durst and M. Kegel, *Computing rotation and self-linking numbers in contact surgery diagrams*, *Acta Math. Hungar.* **150** (2016), 524–540.  
Erratum, *Acta Math. Hungar.* **153** (2017), 537.
- (1) S. Durst, M. Kegel, and M. Klukas, *Computing the Thurston–Bennequin invariant in open books*, *Acta Math. Hungar.* **150** (2016), 441–455.

## Other documents

### Non-refereed contributions:

- (6) V. Bais, A. Barbensi, B. Burton, D. Celoria, C.-S. Hsueh, M. Kegel, J. Licata, A. Merz, J. Spreer, A. Thiele, L. Tobin, *Models for random knots*, Oberwolfach Reports, to appear, 5 pages.
- (5) M. Kegel and M. Silvero, *Khovanov homology of positive knots*, ICERM Highlights (2023), 3 pages.
- (4) M. Kegel, J. Licata, and A. Ray, *Discussions on knot theory in general 3-manifolds*, Oberwolfach Reports **42** (2021), 4 pages.

### Theses:

- (3) M. Kegel, *Legendrian knots in surgery diagrams and the knot complement problem*, Doktorarbeit (Ph.D. thesis), Universität zu Köln, (January 2017), 123 pages.
- (2) M. Kegel, *Symplektisches Füllen von Torusbündeln (Symplectic Fillings of Torus Bundles)*, Masterarbeit (Master thesis), Universität zu Köln (August 2014), 176 pages.
- (1) M. Kegel, *Kontakt-Dehn-Chirurgie entlang Legendre-Knoten (Contact Dehn Surgery along Legendrian Knots)*, Bachelorarbeit (Bachelor thesis), Universität zu Köln (September 2011), 61 pages.

## Employment

- **April 2024 – September 2024:** Substitute professorship at the Ruhr-University Bochum.
- **September 2023 – March 2024:** Substitute professorship at the Ruprecht-Karls-University Heidelberg.
- **July 2023 – August 2024:** Postdoc at the Humboldt University Berlin in the working group of Prof. Chris Wendl.
- **February 2019 – June 2023:** Visiting lecturer (Gastdozent) at the Humboldt University Berlin in the working group of Prof. Chris Wendl.
- **August 2018 – January 2019:** BMS substitute professor at the Humboldt University Berlin in the working group of Prof. Chris Wendl.
- **July 2015 – July 2018:** Teaching assistant (Wissenschaftlicher Mitarbeiter) at the University of Cologne in the working group of Prof. Hansjörg Geiges.

## Education

- **January 2017: Ph.D.** in mathematics (Dr. rer. nat.) at University of Cologne, "Legendrian knots in surgery diagrams and the knot complement problem", 123 pages, Advisor: Prof. Hansjörg Geiges, Grade: magna cum laude (1,0).
- **August 2014: Master** in mathematics (M.Sc.) (Minor: physics) at University of Cologne, Grade: sehr gut (1,1), "Symplektisches Füllen von Torusbündeln" (Symplectic Filling of Torus Bundles), 176 pages, Thesis advisor: Prof. Hansjörg Geiges, Thesis grade: 1,0.

- **September 2011: Bachelor** in mathematics (B.Sc.) (Minor: physics) at University of Cologne  
Grade: sehr gut (1,3),  
"Kontakt-Dehn-Chirurgie entlang Legendre-Knoten" (Contact Dehn Surgery along Legendrian Knots),  
61 pages,  
Thesis advisor: Prof. Hansjörg Geiges,  
Thesis grade: 1,0.
- **June 2007: Allgemeine Hochschulreife** at Gymnasium Köln Nippes.

## Research Talks

### Invited talks:

- (38) *The search for exotic knot traces*, February 2025, BMS Days Conference, TU Berlin (Germany), planned.
- (37) *The search for exotic knot traces*, December 2024, Oberseminar Geometry and Topology, University of Cologne (Germany), planned.
- (36) *The search for exotic knot traces*, December 2024, Workshop on Perspectives in Differential Geometry, Hannover (Germany), planned.
- (35) *Characterizing and non-characterizing knots by 3-manifolds*, November 2024, Workshop on low-dimensional topology, University of Kyoto (Japan), planned.
- (34) *Characterizing and non-characterizing knots by 3-manifolds*, October 2024, Max-Planck-Institut für Mathematik, Bonn (Germany).
- (33) *Characterizing and non-characterizing knots by 3-manifolds*, July 2024, Braids Reunion Workshop, ICERM, Brown University, Providence (United States).
- (32) *The search for exotic knot traces*, May 2024, Geometry Seminar, Heidelberg University (Germany).
- (31) *Contact surgery numbers*, February 2024, CAST Conference on contact and symplectic topology, University of Bochum (Germany).
- (30) *The search for exotic knot traces* (2 talks), November 2023, Dutch Differential Topology and Geometry seminar, Utrecht (Netherlands).
- (29) *Characterizing and non-characterizing knots by 3-manifolds*, October 2023, Topology Seminar, University of Texas at Austin (United States).
- (28) *Characterizing and non-characterizing knots by 3-manifolds*, September 2023, Conference on low-dimensional topology, TIFR Mumbai (India).
- (27) *Minicourse on 4-manifolds and Kirby calculus*, September 2023, Summer school on low-dimensional topology, IISER Pune (India).
- (26) *Characterizing and non-characterizing knots by 3-manifolds*, September 2023, Swiss Knots, Conference on knot theory and low dimensional topology in Switzerland, University of Regensburg (Germany).
- (25) *Khovanov homology of positive links and of L-space knots*, May 2023, University of Trieste (Italy).
- (24) *The search for exotic knot traces*, March 2023, Seminar of Algebra, University of Seville (Spain).
- (23) *The search for alternating and quasi-alternating surgeries*, November 2022, Oberseminar Geometrische Analysis, University of Regensburg (Germany).

- (22) *Stein traces*, October 2022, BACH-Seminar, University of Cologne (Germany).
- (21) *Transverse tori in Engel manifolds*, October 2022, Symplectic Topology Seminar, University of Cologne (Germany).
- (20) *The search for alternating and quasi-alternating surgeries*, September 2022, Max-Planck-Institut für Mathematik, Bonn (Germany).
- (19) *Non-isotopic transverse tori in Engel manifolds*, July 2022, Geometry seminar, University of Munich (Germany).
- (18) *Stein traces*, May 2022, Freemath seminar (online).
- (17) *The search for alternating and quasi-alternating surgeries*, March 2022, Computational seminar for the semester program on braids at ICERM, Brown University, Providence (United States).
- (16) *Stein traces*, February 2022, Massachusetts Institute of Technology (United States).
- (15) *Census  $L$ -space knots are braid positive, except for one that is not*, February 2022, Braids in representation theory and algebraic combinatorics, ICERM, Brown University, Providence (United States).
- (14) *Stein traces*, January 2022, Shanghai Jiao Tong University (online).
- (13) *Characterizing slopes for Legendrian knots*, July 2020, Minisymposium: Geometric analysis and low-dimensional topology at 8th European congress of mathematicians, Portoroz (online).
- (12) *Contact surgery numbers*, January 2021, Workshop on 3-dimensional contact topology, Ankara (online).
- (11) *Characterizing slopes for Legendrian knots*, January 2021, Göttingen topology and geometry seminar (online).
- (10) *Contact surgery numbers*, April 2020, Regensburg working group (online).
- (9) *Constructing symplectic structures from Engel manifolds*, December 2019, Symplectic geometry seminar Heidelberg (Germany).
- (8) *Morse structures on open books and the Euler class of contact structures*, December 2019, Geometry Seminar Heidelberg (Germany).
- (7) *The knot complement problem for Legendrian and transverse knots*, May 2018, Symplectix Seminar Paris (France).
- (6) *The knot complement problem for Legendrian and transverse knots*, January 2018, Hauptseminar Symplektische Geometrie, Universität Heidelberg (Germany).
- (5) *The knot complement problem for Legendrian and transverse knots*, January 2018, Berlin-Hamburg Seminar zur symplektischen Geometrie, Humboldt-Universität zu Berlin (Germany).
- (4) *The knot complement problem for Legendrian and transverse knots*, December 2017, Oberseminar Topologie, Bergische Universität Wuppertal (Germany).
- (3) *The knot complement problem for Legendrian and transverse knots*, October 2017, Oberseminar Symplektische Geometrie, Westfälische Wilhelms Universität Münster (Germany).
- (2) *The knot complement problem for Legendrian and transverse knots*, June 2017, Geometry seminar, University of Munich (Germany).
- (1) *The Legendrian knot complement problem*, June 2016, LKS-Seminar, University Regensburg (Germany).

**Contributed talks:**

- (10) *Census L-space knots are braid positive, except for one that is not*, February 2023, Winterbraids XII, Tours (France).
- (9) *Khovanov homology of positive fibered links and L-space knots*, January 2023, Workshop on morphisms in low-dimensional topology, Mathematisches Forschungsinstitut Oberwolfach (MFO), Oberwolfach (Germany).
- (8) *Open books on 4-manifolds*, June 2022, Conference on surfaces in 4-manifolds, Le Croisic (France).
- (7) *Stein traces*, March 2022, Braids in Symplectic and Algebraic Geometry, ICERM, Brown University, Providence (United States).
- (6) *Algorithms with fibered links and closures of positive braids*, March 2022, Post Doc/Graduate Student Seminar for the semester program on braids at ICERM, Brown University, Providence (United States).
- (5) *Contact surgery numbers*, April 2020, Trends in low dimensional topology (online).
- (4) *Taut foliations and tight contact structures* (2 talks), October 2019, Workshop on Foliations, Regensburg (Germany).
- (3) *The knot complement problem for Legendrian and transverse knots*, February 2018, Winter Braids VIII, CIRM, Marseille (France).
- (2) *Lagrangian projections in contact 3-manifolds*, September 2017, SFB Retreat 2017, Tagungszentrum Maria in der Aue (Germany).
- (1) *The knot complement problem for Legendrian and transverse knots*, October 2016, Conference on 4-manifolds and knot concordance, Max Planck Institute for Mathematics, Bonn (Germany).

**Local seminar talks:**

- (23) *Applications of Heegaard Floer homology*, December 2024, Symplectic geometry seminar, Humboldt University Berlin, planned.
- (22) *Contact Kirby moves*, November 2024, Working group seminar on geometric topology, Humboldt University Berlin.
- (21) *Detecting fibered links via Reeb dynamics*, July 2024, ACDC Seminar, Ruhr-University Bochum.
- (20) *Stein traces*, November 2023, Symplectic geometry seminar, Heidelberg University.
- (19) *Transverse tori in Engel manifolds*, October 2022, Symplectic geometry seminar, Humboldt University Berlin.
- (18) *Stein traces*, November 2021, Symplectic geometry seminar, Humboldt University Berlin.
- (17) *Heegaard Floer homology and the isomorphism with embedded contact homology I - Introduction to Heegaard Floer homology and Lipshitz's cylindrical reformulation*, February 2021, Symplectic geometry seminar, Humboldt University Berlin.
- (16) *Surgery along Chekanov's knots*, July 2020, Symplectic geometry seminar, Humboldt University Berlin.
- (15) *Open questions about open books*, April 2019, Symplectic geometry seminar, Humboldt University Berlin.
- (14) *Parallelizability of 3-manifolds via surgery* (2 talks), October 2018, Symplectic geometry seminar, Humboldt University Berlin.

- (13) *Unit tangent bundles of orbifolds*, October 2017, Symplectic topology seminar, University of Cologne.
- (12) *Normal curves on surfaces*, May 2017, Symplectic topology seminar, University of Cologne.
- (11) *Legendrian knots in surgery diagrams and the knot complement problem*, January 2017, Disputation, University of Cologne.
- (10) *Contact cabling*, July 2016, Symplectic topology seminar, University of Cologne.
- (9) *Complements of transverse knots*, April 2016, Symplectic topology seminar, University of Cologne.
- (8) *Surgery descriptions of Legendrian knots*, April 2016, Symplectic topology seminar, University of Cologne.
- (7) *Orbifolds and coverings*, January 2016, Symplectic topology seminar, University of Cologne.
- (6) *Computation of the Thurston–Bennequin invariant in surgery diagrams*, October 2015, Symplectic topology seminar, University of Cologne.
- (5) *Legendrian knots and their complements*, July 2015, Symplectic topology seminar, University of Cologne.
- (4) *Stable Hamiltonian structures*, April 2015, Symplectic topology seminar, University of Cologne.
- (3) *Symplectic fillability of torus bundles*, October 2014, Symplectic topology seminar, University of Cologne.
- (2) *The topology of Lefschetz fibrations* (2 talks), October 2014, Symplectic topology seminar, University of Cologne.
- (1) *Contact surgery along Legendrian links* (2 talks), June 2011, Symplectic topology seminar, University of Cologne.

## Research stays

- **November 2024:** *Kyoto*, Japan, 1 week, planned. Host: Tetsuya Ito
- **July 2024:** *Montreal*, Canada, 1 week. Host: Duncan McCoy
- **November 2023:** *Universiteit Utrecht*, Netherlands, 1 week. Host: Álvaro del Pino Gómez
- **October 2023:** *University of Texas at Austin*, United States, 1 week. Host: Lisa Piccirillo
- **September 2023:** *IISER Pune*, India, 2 weeks. Host: Tejas Kalelkar
- **March 2023:** *University Seville*, Spain, 1 week. Host: Marithania Silvero
- **October 2022:** *University of Cologne*, Germany, 1 week. Host: Hanjörg Geiges
- **September 2022:** *University of Vienna*, Austria, 1 week. Host: Vera Vértési
- **September 2022:** *Max-Planck-Institut für Mathematik*, Bonn, Germany, 1 week. Host: Arunima Ray
- **March 2022:** *University of Miami*, USA, 1 week. Host: Kenneth L. Baker
- **February – April 2022:** *ICERM, Brown University*, Providence, USA, 3 months. As part of the semester program on "Braids".
- **August 2020:** *Mathematisches Forschungsinstitut Oberwolfach*, Germany, 1 month. As Oberwolfach research fellow.

- **February 2018:** *CIRM, Centre International de Rencontres Mathématiques*, Marseille, France, 2 weeks. For participating in the conferences "Winter Braids VIII" and "Knotted Embeddings in Dimension 3 and 4".
- **November 2017:** *Westfälische Wilhelms Universität Münster*, Germany, 3 days. Host: Kai Zehmisch

## Organization of research events

- **November 2024** Berlin-Brandenburg Workshop IV: Knot Theory and its Applications, Humboldt University Berlin (together with T. Andriamanalina, C.-S. Hsueh, and N. Manikandan), planned.
- **September 2024** Workshop on 4-manifolds and algorithms, University Regensburg (together with S. Friedl).
- **12 July 2024** Berlin-Brandenburg Workshop III: Knot Theory and its Applications, University Potsdam (together with T. Andriamanalina and N. Manikandan).
- **17 November 2023** Berlin-Brandenburg Workshop II: Knot Theory and its Applications, Freie Universität Berlin (together with T. Andriamanalina and J. Spreer).
- **14 July 2023** Berlin-Brandenburg Workshop I: Knot Theory and its Applications, Humboldt University Berlin (together with C.-S. Hsueh and N. Manikandan).
- **September 2022:** *DMV-Jahrestagung 2022*, Section S06: Topology and Geometry, Freie Universität Berlin (Germany). Organizer (together with N. Bottman, M. Land, and L. Lewark).
- **Summer 2021 – 2023** Student research seminar on the SnapPy census knots, weekly research seminar for students, Humboldt University Berlin.

## Teaching

### **Ruhr University Bochum:**

- **Summer term 2024:** Lecture "Geometric Topology" (weekly 4 hours lecture + 2 hours exercise session).
- **Summer term 2024:** Seminar on contact geometry (weekly 2 hours).

### **Ruprecht-Karls-University Heidelberg:**

- **Winter term 2023/24:** Lecture "Contact geometry" (weekly 4 hours lecture + 2 hours exercise session, in total: 96 hours teaching).
- **Winter term 2023/24:** Seminar on hyperbolic knot theory (weekly 2 hours, in total: 32 hours teaching).
- **Winter term 2023/24:** RTG-Lecture "Handling the Poincaré conjecture" (2 hours lecture every other week, in total: 12 hours teaching).

### **Humboldt University Berlin:**

- **Summer term 2024:** Lecture "Topologie I" (weekly 4 hours lecture, in total: 64 hours teaching).
- **Summer term 2023:** Exercise session for the lecture "Topologie II" (weekly 2 hours, in total: 32 hours teaching).

- **Summer term 2023:** Seminar on hyperbolic knot theory (weekly 2 hours, in total: 28 hours teaching).
- **Winter term 2022/23:** Lecture "Differential Geometry I: Curves and surfaces" (weekly 4 hours lecture, in total: 64 hours teaching).
- **Summer term 2022:** Exercise session for "Differential Geometry II" (weekly 2 hours, in total: 28 hours teaching).
- **Winter term 2021/22:** Lecture "Topology II" (weekly 4 hours lecture, in total: 64 hours teaching).
- **Summer 2021** – Student research seminar on the SnapPy census knots, weekly research seminar for students. (Research seminar for students, no official teaching, but weekly meetings.)
- **Summer term 2021:** Lecture "4-Manifolds and Kirby calculus" (weekly 2 hours lecture + 1 hour exercise session, in total: 42 hours teaching).
- **Winter term 2020/21:** Lecture "Topology II" (weekly 4 hours lecture + 2 hours exercise session, in total: 96 hours teaching).
- **Winter term 2020/21:** "Seminar on selected topics in algebraic and differential topology" (weekly 2 hours, in total: 32 hours teaching).
- **Summer term 2020:** Lecture "Topology of 3-Manifolds" (weekly 2 hours lecture + 1 hour exercise session, in total: 42 hours teaching).
- **Winter term 2019/20:** Lecture "Topology II" (weekly 4 hours lecture + 2 hours exercise session, in total: 96 hours teaching).
- **Summer term 2019:** Lecture "Topologie I" (weekly 4 hours lecture + 2 hours exercise session, in total: 84 hours teaching).
- **Winter term 2018/19:** "Seminar zur Differentialtopologie" (weekly 2 hours, in total: 32 hours teaching).
- **Winter term 2018/19:** Exercise session for the lecture "Geometrie" by Prof. Klaus Mohnke (weekly 2 hours, in total: 32 hours teaching).

#### University of Cologne:

- **Summer term 2018:** Lecture "Kirby-Kalkül" (weekly 2 hours lecture + 2 hours exercise session, in total: 56 hours teaching).
- **Winter term 2017/18:** Teaching Assistant for the lecture "Elementare Differentialgeometrie" by Prof. Silvia Sabatini.
- **Summer term 2017:** Teaching Assistant and exercise session for the lecture "Topologie" by Prof. Hansjörg Geiges (weekly 2 hours, in total: 30 hours teaching).
- **Winter term 2016/17:** Teaching Assistant and exercise session for the lecture "Symplectic Geometry" by Dr. Milena Pabiniak (weekly 2 hours, in total: 30 hours teaching).
- **Summer term 2016:** Teaching Assistant and exercise session for the lecture "Differential Geometry" by Dr. Milena Pabiniak (weekly 2 hours, in total: 30 hours teaching).
- **Winter term 2015/16:** Teaching Assistant for "Seminar über Topologie" by Prof. Hansjörg Geiges (weekly 2 hours, in total: 30 hours teaching).

- **2010–2014:** Tutor for mathematical lectures, including Mathematics I and II, Differential Equations, Complex Analysis, Geometry of Celestial Mechanics, Topology and Dynamical Systems, Surfaces and Elementary Differential Geometry (weekly 2-4 hours).
- **2008–2011:** Teacher training for mathematics and physics at University of Cologne, including courses in pedagogy and concerning the principles of teaching mathematics and physics.
- **September 2009:** Internship at Erich Kästner-Gymnasium Köln Niehl, 2 weeks.

**Postdocs mentored:**

- Monika Yadav, Humboldt University Berlin, November – December 2024, with funding from the *WINS Postdoctoral fellowship*.

**Supervised Ph.D. theses:**

- Chun-Sheng Hsueh, Humboldt University Berlin, September 2023 – September 2026, with funding from the *Claussen-Simon-foundation*.

**BMS student mentor:**

- Annika Thiele, Humboldt University Berlin, since April 2024.

**BMS qualifying exam:**

- Laurenz Upmeyer zu Belzen, 2023, Humboldt University Berlin.
- Li Li, 2021, Humboldt University Berlin.

**Supervised master theses:**

- Farid A. Azar León, *Torsion in the Khovanov homology of 3-braids*, Humboldt University Berlin, in progress.
- Léo Mousseau, *The L-space conjecture*, Humboldt University Berlin, in progress.
- Frank Selensky, *Obstruction classes of contact structures*, Humboldt University Berlin, in progress.
- Sarah Pestkowski, *Ein optimales Papier-Möbius-Band*, Humboldt University Berlin, in progress.
- Chun-Sheng Hsueh, *Kirby diagrams of 4-dimensional open books*, 2023, Humboldt University Berlin. Published as: C.-S. Hsueh, *Kirby diagrams of 4-dimensional open books*, arXiv:2306.16942, submitted.
- David Suchodoll: *The Thurston–Bennequin invariant in branched covers*, 2022, Humboldt University Berlin.

**Master theses, second evaluator:**

- Levent Kotan, *Operads*, Humboldt University Berlin, in progress.
- Laurenz Upmeyer zu Belzen, *Symplectic Fillability of Planar Open Books*, 2023, Humboldt University Berlin.

### Supervised Bachelor theses:

- Arthur Berns, *The 6-theorem*, 2024, Humboldt University Berlin.
- Annika Thiele, *Algorithmic detections of fibered and positiv knots*, 2023, Humboldt University Berlin.
- Luis Kristic, *Hyperbolic knot theory and the A-polynomial*, 2023, Humboldt University Berlin.
- Frank Selensky, *Chern classes of high dimensional contact structures via open books*, 2023, Humboldt University Berlin. Currently under preparation for publication.
- Léo Mousseau, *Algorithms for computing the slice 4-genus and the unknotting number*, 2023, Humboldt University Berlin.
- Pau Punset, *Fibered links and orientations*, 2023, Universidad de Barcelona (as external supervisor).
- Fetih Ayaz, *Classification of surfaces via normal curves*, 2021, Humboldt University Berlin. Published as: F. Ayaz, M. Kegel, and K. Mohnke, *The classification of surfaces via normal curves*, *Jahresber. Dtsch. Math.-Ver.*
- Max Huneshagen, *Das HOMFLYPT-Polynom*, 2020, Humboldt University Berlin.
- Léo Duc, *Regular homotopy classes of Legendrian immersions*, 2019, Humboldt University Berlin.
- Paulina Bock de Barillas, *Der Satz von Whitney–Graustein, ein klassischer und ein kontaktgeometrischer Beweis*, 2019, Humboldt University Berlin.
- Bernhard Albach, *Reidemeisterbewegungen von Legendre-, transversalen und glatten Verschlingungen*, 2018, (supervised together with Hansjörg Geiges), University of Cologne.

### Bachelor theses, second evaluator:

- Florian Buck, *Kontaktstrukturen auf Brieskorn-Mannigfaltigkeiten*, 2004, Ruhr University Bochum.
- Joachim Albrecht, *Hyperbolic metrics on surfaces with finitely many punctures*, 2024, Humboldt University Berlin.
- Leonard Vetter, *Topological recursion and open-closed topological quantum field theories*, 2023, Humboldt University Berlin.
- Maurice Parzonka, *Das Lemma von Sperner und seine Anwendung in einem Beweis des Brouwerschen Fixpunktsatzes*, 2023, Humboldt University Berlin.
- Luisa Gerlach, *Satz von Markov ? von Knoten und Zöpfen*, 2022, Humboldt University Berlin.
- Jan Philipp Bohl, *Existence of contact structures on 3-manifolds*, 2021, Humboldt University Berlin.
- Jim Ye, *Hurwitz-Zahlen und ihre Berechnungsmethoden*, 2021, Humboldt University Berlin.
- Marie Christin Schmidlein, *Symplectic fillings and Lefschetz fibrations in dimension four*, 2020, Humboldt University Berlin.
- Laurenz Upmeier zu Belzen, *Milnor construction of universal bundles*, 2019, Humboldt University Berlin.

### Supervised final projects for the lecture Kirby-Kalkül (SS 2018):

- Bernhard Albach, *Blätterungen von 3-Mannigfaltigkeiten*, University of Cologne.
- Franziska Frede, *Nicht-destabilisierbare Heegaard-Zerlegungen*, University of Cologne.
- Konstantin Müller, *Heegaard- und Henkelzerlegungen von 3-Mannigfaltigkeiten mit Rand*, University of Cologne.
- Laura Maria Poreschack, *Homologie und Henkelzerlegungen*, University of Cologne.
- Lennart Struth, *Hakens Lemma*, University of Cologne.

### Service

- Reviewer for *MathSciNet* and *Zentralblatt MATH*.
- Referee and quick opinions for *Bulletin of the Australian Mathematical Society*, *Bulletin of the Brazilian Mathematical Society*, *Bulletin of the London Mathematical Society*, *Canadian Mathematical Bulletin*, *International Mathematics Research Notices*, *Journal of Symplectic Geometry*, *K3: Kirby's problem list*, *Mediterranean Journal of Mathematics*, *Memoirs of the AMS*, *Proceedings of the Edinburgh Mathematical Society*, and *Topology and its Applications*.

### (Co-)Organization

- **Winter term 2021/22 and Summer term 2022:** Learning Seminar: Proof of the topological Poincaré conjecture in dimension 4, following the book *The disk embedding theorem* edited by S. Behren, B. Kalmár, M. Kim, M. Powell, A. Ray, Humboldt University Berlin.
- **19–20 October 2017:** The stabilisation height of fibre surfaces, Lecture series by Filip Misev, University of Cologne.
- **Winter term 2017/18:** Learning Seminar: Computational Topology, following the book *Computational Topology* by H. Edelsbrunner and J. Harer, University of Cologne.
- **17–19 March 2017:** Morse Structures on Open Books, Lecture series by Joan Licata, University of Cologne.
- **Summer term 16:** Learning Seminar: Cobordism theory, following the lecture notes *Notes on Cobordism* by H. Miller, University of Cologne.
- **Winter term 2015/16:** Contact topology graduate student seminar, University of Cologne.
- **Summer term 2015:** Contact topology graduate student seminar, University of Cologne.
- **Summer term 2015:** Fellow Seminar of the Graduiertenkolleg 2015, University of Cologne.
- **Winter term 2014/15:** Fellow Seminar of the Graduiertenkolleg 2014, University of Cologne.
- **Summer term 2014:** Learning Seminar: Algebraic Geometry, following the book *Algebraic Geometry* by R. Hartshorne, University of Cologne.
- **Winter term 2013/14:** Learning Seminar: Kirby calculus, following part 2 of *4-Manifolds and Kirby Calculus* by R. Gompf and A. Stipsicz, University of Cologne.
- **Summer term 2013:** Learning Seminar: Characteristic classes II, following the book *Characteristic Classes* by J. Milnor and J. Stasheff, University of Cologne.
- **Winter term 2012/13:** Learning Seminar: Characteristic classes I, following the book *Characteristic Classes* by J. Milnor and J. Stasheff, University of Cologne.

## Languages

- German
- English

Berlin, November 22, 2024