Lukas Lewark — Curriculum Vitae

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Employment

since 08/23	Senior Scientist at the ETH Zürich.
04/19 – 07/23	Emmy Noether Independent Junior Research Group Leader at the University of Regensburg. My project *Quantum invariants, knot concordance and unknotting* was funded by the DFG.
08/14 – 02/19	Postdoc at the University of Bern with Sebastian Baader.
04/13 – 03/14	Postdoc at Durham University with Andrew Lobb.

Education and Diploma

07/23	Habilitation at the Universität Regensburg.
10/09 – 06/13	PhD at the Institut de Mathématiques de Jussieu (IMJ), Paris, France. Thesis *Khovanov-Rozansky homologies, knotted weighted webs and the slice genus* supervised by Christian Blanchet. Defended 28 June 2013.
01/08 – 05/09	MSc Math. with distinction at ETH Zürich, Switzerland.
09/04 – 03/08	BSc Math. at ETH Zürich.
06/04	Abitur at Friedrich Gymnasium, Freiburg, Germany.

Visits

04/23 – 05/23	Guest of the FIM at the ETH Zürich.
01/17 – 06/17	*Homology Theories in Low Dimensional Topology* at Newton Institute in Cambridge for a total of four weeks.
10/16	Guest of the MPIM Bonn.
04/14 – 07/14	Guest of the MPIM Bonn.

Research group

09/20 – 08/22	Claudius Zibrowius (postdoc).
04/19 – 03/23	Damian Iltgen (PhD student, defended 9 February 2023).

Publications

Peer-reviewed articles

20. *On the values taken by slice torus invariants* — by P. Feller, L. Lewark, A. Lobb. **Mathematical Proceedings of the Cambridge Philosophical Society** (accepted for publication). https://arxiv.org/abs/2202.13818
19. *Quasipositivity and braid index of pretzel knots* — by L. Lewark. **Communications in Analysis and Geometry** (accepted for publication). https://arxiv.org/abs/2205.05347
18. *Squeezed Knots* — by P. Feller, L. Lewark, A. Lobb. **Quantum Topology** (accepted for publication). https://arxiv.org/abs/2202.12289
17. *Almost positive links are strongly quasipositive* — by P. Feller, L. Lewark, A. Lobb. **Mathematische Annalen** (2023), vol. 385, pp. 481–510. https://doi.org/10.1007/s00208-021-02328-x
16. *Rasmussen invariants* — by L. Lewark, C. Zibrowius. **Mathematical Research Postcards** (2021), vol. 1 no. 2. https://secure.math.ubc.ca/Links/mrp/
15. *Homotopy ribbon concordance, Blanchfield pairings, and twisted Alexander polynomials* — by S. Friedl, T. Kitayama, L. Lewark, M. Nagel, M. Powell. **Canadian Journal of Mathematics** (2022), vol. 74, no. 4, pp. 1137–1176. https://doi.org/10.4153/S0008414X21000183
14. *Untwisting 3-strand torus knots* — by S. Baader, I. Banfield, L. Lewark. **Bulletin of the London Mathematical Society** 52 (2020), no. 3, pp. 429–436. http://dx.doi.org/10.1112/blms.12335
13. *Balanced algebraic unknotting, linking forms, and surfaces in three- and four-space* — by P. Feller, L. Lewark. **Journal of Differential Geometry** (accepted for publication). https://arxiv.org/abs/1905.08305
12. *Average four-genus of two-bridge knots* — by S. Baader, A. Kjuchukova, L. Lewark, F. Misev, A. Ray. **Proceedings of the AMS** (accepted for publication). https://doi.org/10.1090/proc/14784
11. *Upsilon-like concordance invariants from $\mathfrak{sl}_n$ knot cohomology* — by L. Lewark, A. Lobb. **Geometry & Topology** 23 (2019), no. 2, pp. 745–780. https://doi.org/10.2140/gt.2019.23.745
10. *Checkerboard graph monodromies* — by S. Baader, L. Lewark, L. Liechti. **L'Enseignement Mathématique** 64 (2018), no. 2, pp. 65–88. https://doi.org/10.4171/LEM/64-1/2-3
9. *On calculating the slice genera of 11- and 12-crossing knots* — by L. Lewark, D. McCoy. **Experimental Mathematics** 28 (2019), no. 1, pp. 81–94. https://doi.org/10.1080/10586458.2017.1353453

8. *On classical upper bounds for slice genera* — by P. Feller, L. Lewark. **Selecta Mathematica** 24 (2018), no. 5, pp. 4885–4916. http://doi.org/10.1007/s00029-018-0435-x
7. *Khovanov width and dealternation number of positive braid links* — by S. Baader, P. Feller, L. Lewark, R. Zentner. **Mathematical Research Letters** 26 (2019), no. 3, pp. 627–641. https://dx.doi.org/10.4310/MRL.2019.v26.n3.a1
6. *On the topological 4–genus of torus knots* — by S. Baader, P. Feller, L. Lewark, L. Liechti. **Transactions of the AMS** 370 (2018), no. 4, pp. 2639–2656. https://doi.org/10.1090/tran/7051
5. *The stable 4–genus of alternating knots* — by S. Baader, L. Lewark. **Asian Journal of Mathematics** 21 (2017), no. 6, pp. 1183–1190. https://doi.org/10.4310/AJM.2017.v21.n6.a8
4. *New quantum obstructions to sliceness* — by L. Lewark, A. Lobb. **Proceedings of the LMS** 11 (2016), no. 1, pp. 81–114. https://doi.org/10.1112/plms/pdv068
3. *On stable $\mathfrak{sl}_3$–homology of torus knots* — by E. Gorsky, L. Lewark. **Experimental Mathematics** 24 (2015), no. 2, pp. 162–174. https://doi.org/10.1080/10586458.2014.963746
2. *Rasmussen's spectral sequences and the $\mathfrak{sl}_N$–concordance invariants* — by L. Lewark. **Advances in Mathematics** 260C (2014), pp. 59–83. https://doi.org/10.1016/j.aim.2014.04.003
1. *$\mathfrak{sl}_3$–foam homology calculations* — by L. Lewark. **Algebraic & Geometric Topology** 13 (2013), no. 6, pp. 3661–3686. https://doi.org/10.2140/agt.2013.13.3661

Preprints

3. *3-braid knots with maximal 4-genus* — by S. Baader, L. Lewark, F. Misev, P. Truöl. https://arxiv.org/abs/2303.11918
2. *Rasmussen invariants of Whitehead doubles and other satellites* — by L. Lewark, C. Zibrowius. https://arxiv.org/abs/2208.13612
1. *Khovanov homology and rational unknotting* — by D. Iltgen, L. Lewark, L. Marino. https://arxiv.org/abs/2110.15107

Teaching

Courses

2023 *Analysis II* for Computer Science, ETHZ.
Mathematik I for Earth and Climate, Food, Agricultural, and Environmental Sciences (co-taught with Ana Cannas), ETHZ.
2020 *Analysis III* for Physics, Regensburg.
2019 *Knot Theory*, mathematics bachelor/master, Regensburg.
2018 *Algebraic Topology*, mathematics master, Bern.
2017 *Mathematics*, first-year biology, Bern.
2017 Seminar *Quadratic Forms in Topology*, mathematics master, Bern.
2016 *Topology*, mathematics bachelor/master, Bern.
2015 *Graph Theory* mathematics bachelor/master, Bern.
2013 *Mathematics ("MM2")*, first-year mathematics, IMJ, co-taught with two other lecturers.

Supervision

'22 – '23 Second advisor for the PhD thesis of Paula Truöl at ETH Zürich.
2022 Master thesis *Implementing the Sarkar-Wang nicefication algorithm for Heegaard diagrams* by Ludovico Morellato (co-supervised with Claudius Zibrowius), in Regensburg.
2021 Master thesis *Determining the Seifert genus via the Heegaard Floer tangle invariant HFT* by Benedikt Aubeck (co-supervised with Claudius Zibrowius), in Regensburg.
2020 Master thesis *Khovanov homology and the unknotting number* by Laura Marino, in Regensburg.
2019 Master thesis *On the Slice Genus of Twist Knots* by Damian Iltgen, in Bern.
'16 – '18 Bachelor theses *A Different Approach to Alternating Knots* by Nafie Tairi, *Small Cancellation Theory* by Claire Gürtler, *Forbidden minors of partial 3-trees* by Marc Trautmann, all in Bern.

Further teaching

2023 One-week minicourse on *Khovanov homology* at the Baby geometri seminar in Pisa.
2020 Reading course on *Khovanov homology*.
'16 – '18 One-week introductory courses for first-years (3 times, Bern).
'10 – '11 One-week repetition courses for first-years (twice, ETHZ).
2009 One semester at the high school Alte Kantonsschule Aarau.
'06 – '18 12 exercise classes in total taught at ETHZ, IMJ and in Bern.
'06 – '09 Co-supervision of seminars for the participants of the Landeswettbewerb Mathematik Baden-Württemberg (4 times).

Conference and seminar organization

2023 *Swiss Knots* in Regensburg.
2022 Section *Topology and Geometry* of the *DMV Annual Meeting* in Berlin.
since '21 *[K-OS] Knot online seminar.*
2021 *Swiss Knots* in Fribourg (member of scientific committee).
2021 *Perspectives on quantum link homology theories* in Regensburg.
'20 – '21 *Regensburg low-dimensional geometry & topology seminar*, online.
2019 *Workshop on low-dimensional topology* in Regensburg.
2019 *5th Bavarian Geometry & Topology Meeting* in Regensburg.
2019 *Swiss Knots* at ETHZ.
2017 *Swiss Knots* in Bern.

Service

'19 – '23 Deputy women's representative of the Faculty of Mathematics in Regensburg.
since '18 Reviewer for MR.
'15 – '19 PhD/postdoc delegate at the Faculty of Science in Bern.
since '14 Referee for various journals.
since '14 Reviewer for zbMath.
'11 – '13 Member of the administration of the IMJ's PhD-students.

Selected Talks

Conferences

2023 · *Oberwolfach Workshop Morphisms in Low Dimensions.*
2022 · BIRS Workshop *Using Quantum Invariants to do Interesting Topology* in Oaxaca.
· *Georgia Topology Conference*, Athens.
· *Recent developments in link homology theories* at the SwissMAP Research Station.
2019 · *Trisections of smooth 4-manifolds* in Matemale.
· *Knot concordance and low-dimensional manifolds* in Le Croisic.
· *Workshop on 4-manifolds* at the MPIM.
2018 · *Quantum Knot Homology and Supersymmetric Gauge Theories* at the Aspen Center for Physics.
2017 · *Quantum topology and categorified representation theory* at the Newton Institute Cambridge.
2016 · BIRS Workshop *Synchronizing Smooth and Topological 4-Manifolds.*
2015 · Joint AMS-EMS-SPM meeting in Porto.
2014 · *Knots in Washington XXXVII.*
· *Topologie géométrique et quantique en dimension 3* at the CIRM.
· Oberwolfach Workshop *Topologie*
· DMV-PTM Joint Meeting in Poznań.

2013 · *Swiss Knots* in Bern.
· *Young topology meeting* in London.
· Workshop on *Geometry and topology of smooth 4-manifolds* at the MPIM.

Seminars

2023 Geneva.
2022 Notre Dame, Göttingen, Zürich, Fribourg.
2020 K-OS, CIRGET.
2019 IMJ, Bern, Grenoble.
2018 Bonn, Basel, Warsaw, Regensburg, Boston College.
2017 Marseille, Montpellier, Geneva, University of Zürich, Strasbourg.
2016 HIM (Bonn), Regensburg.
2015 IMJ, University of Zürich.
2014 Tohoku, Bourgogne, MPIM Oberseminar, Aaarhus.
2013 Geneva, London Geometry and Topology Seminar, Boston College, UC Davis, Joint LA Topology Seminar, Stony Brook, Louvain.

Miscellaneous

Languages: German (native), English (fluent), French (good).

Computer programs:

`khoca` for computation of $\mathfrak{sl}_n$ knot homologies, see `https://github.com/LLewark/khoca`.

`foamho` for computation of $\mathfrak{sl}_3$ knot homology, see `http://lewark.de/lukas/foamho.html`.

Various further programs available from `https://github.com/LLewark`.

Last update: November 2023.