Maggie Miller: Curriculum Vitae

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Research Interests

I am interested in questions about geometric topology and knotting in dimensions 3 and 4. In particular, I think about knotted surfaces smoothly or locally flatly embedded in 4-manifolds.

Professional Positions

2023 –	**Assistant Professor, University of Texas at Austin** Department of Mathematics
2021 –	**Clay Research Fellow, Clay Mathematics Institute**
2021 – 2023	**Stanford Science Fellow, Stanford University** *STEM postdoctoral fellowship* Faculty mentor: Ciprian Manolescu
2020 – 2021	**NSF Postdoctoral Fellow, Massachusetts Institute of Technology** Scientific sponsor: Tomasz Mrowka

Education

2015 – 2020	**Ph.D. in Mathematics, Princeton University** NSF Graduate Fellow, Charlotte Elizabeth Procter Fellow Dissertation: "Extending fibrations of knot complements to ribbon disk complements" Advised by David Gabai
2011 – 2015	**Bachelor of Science: Mathematics Honors Option, University of Texas at Austin** High Honors, Special Honors in Mathematics, Dean's Honored Graduate Senior Thesis: "Fiberedness of almost-Montesinos knots" Advised by Cameron Gordon

Selected Awards/Fellowships

2023	Forbes 30 Under 30 (Science)
2023	Maryam Mirzakhani New Frontiers Prize
2021 – 2025	Clay Research Fellowship
2021 – 2024	Stanford Science Fellowship
2020 – 2021	NSF Mathematical Sciences Postdoc Research Fellowship
2018	Princeton Mathematics Graduate Teaching Award
2016 – 2020	National Science Foundation Graduate Research Fellowship
2015	College of Natural Sciences Dean's Honored Graduate, UT Austin

Outreach Activities

2023 –	UT Austin undergraduate Putnam practice (with Theresa Martines)
2019 – 2023	Geometric Topology Grad and Postdoc Seminar (sole organizer until June 2021, then joint with Tam Cheetham-West and Luya Wang)
Summer 2021	Mentor in the Summer Research – Early Identification Program (Program meant to encourage unrerepresented students to pursue graduate education) *Mentored an undergraduate research project in 4-dimensional topology*
2015 – 2020	Noetherian Ring (Princeton women in mathematics) graduate representative *Co-founded a Noetherian Ring lecture series at Princeton in Spring 2019*
2018 – 2020	Princeton Graduate Teaching Fellow *Developed and led instructor orientations for grad students in 2018 and 2019*
2017 – 2020	Princeton Science Café (STEM outreach to children aged 9–15)

Mathematical Organization Activities

August 2024	BIRS Workshop #24w5291 "What's your trick? A non-traditional conference in low-dimensional topology," at the Banff International Research Station (with John Baldwin, Andrew Lobb, Lisa Piccirillo, Liam Watson)
June 2024	Trisectors Workshop 2024: Connections with Knotted Surfaces at University of Nebraska–Lincoln (with Román Aranda, Jeffrey Meier, Laura Starkston, Alexander Zupan)
June 2023	Trisectors Worskhop 2023: Connections with Symplectic Topology at UC Davis (with Gabriel Islambouli, Jeffrey Meier, Laura Starkston, Alexander Zupan)
May 2023	Moab Topology Conference 2023 at Utah State University Moab (with Nathan Geer, Mark Hughes, Matt Young)
January 2023	Workshop #2304 "Morphisms in Low Dimensions," at the Oberwolfach Research Institute for Mathematics (with Andrew Lobb and Arunima Ray)
November 2022	BIRS Workshop #22w5065 "Topology in Dimension 4.5" at the Banff International Research Station (with David Gay, Jason Joseph, Hannah Schwartz)
October 2022	"Special Session on Knotted Surfaces and Concordances," at the 2022 Fall Western AMS Sesional Meeting (with Mark Hughes and Patrick Naylor)
June 2022	"Developments in Four Dimensions," week-long conference at the University of Victoria (with Ryan Budney and Jeffrey Meier).
April 2022	"Special Session on Knot Theory in Dimension Four," at JMM 2022 (with Jeffrey Meier and Patrick Naylor).
Spring 2021	"4D Topology" AIM Research Community (with Miriam Kuzbary, Juanita Pinzón-Caicedo, Hannah Schwartz)
October 2020	"Special session on knotted surfaces and concordances," at the 2020 Fall Western AMS Sectional Meeting (with Mark Hughes and Jeffrey Meier)
June 2020	"Knots, surfaces, and 4-manifolds," special topic in the Carbon-Neutral Geometric Topology Conference (with JungHwan Park)

Miscellaneous Activities

I am a member of an AIM SQuaRE (running 2020–2025) studying Casson-Gordon homotopy 4-balls. My SQuaREmates are Paolo Aceto, Nickolas A. Castro, JungHwan Park, and András Stipsicz.

Papers and Preprints

[30] A. Conway, I. Dai, M. Miller, *$\mathbb{Z}$-disks in $\mathbb{C}P^2$*, arXiv: 2403.10080 [math.GT], Mar. 2024.

[29] M. Hughes, S. Kim, M. Miller, *Branched covers of twist-roll spun knots*, arXiv: 2402.11706 [math.GT], Feb. 2024.

[28] A. J. Lobb, M. Miller, A. Ray, *Morphisms in Low Dimensions*, Oberwolfach Rep. **20**(1):215–259, 2023.

[27] M. Hughes, S. Kim, M. Miller, *Non-isotopic splitting spheres for a split link in S^4*, arXiv:2307.12140 [math.GT], July 2023. Submitted.

[26] P. Aceto, N. A. Castro, M. Miller, JH. Park, A. Stipsicz, *Slice obstructions from genus bounds in definite 4-manifolds* , arXiv:2303.10587 [math.GT], Mar. 2022. Submitted.

[25] M. Miller, *Explicitly describing fibered 3-manifolds through families of singularly fibered surfaces*, to appear in Proc. Sympos. Pure Math. "Frontiers in Geometry and Topology."

[24] M. Klug and M. Miller, *Concordance of spheres in 4-manifolds with an immersed dual sphere*, arXiv:2211.07177 [math.GT], Nov. 2022. Submitted.

[23] J. Joseph, J. Meier, M. Miller, A. Zupan, *Bridge trisections and Seifert solids*, to appear in Algebr. Geom. Topol.

[22] K. Hayden, S. Kim, M. Miller, JH. Park, and Isaac Sundberg, *Seifert surfaces in the 4-ball*, arXiv:2205.15283 [math.GT], May 2022. Submitted.

[21] J. Joseph, J. Meier, M. Miller, A. Zupan, *Bridge trisections and classical knotted surface theory*, Pac. J. Math. **319**(2):343–369, 2022.

[20] M. Hughes, S. Kim, M. Miller, *Knotted handlebodies in the 4-sphere and 5-ball*, to appear in J. Eur. Math. Soc.

[19] M. Hughes, S. Kim, M. Miller, *Band diagrams of immersed surfaces in 4-manifolds*, arXiv:2108.12794 [math.GT], Aug. 2021. Submitted.

[18] K. Hayden, A. Kjuchukova, S. Krishna, M. Miller, M. Powell, and N. Sunukjian, *Brunnian exotic surface links in the 4-ball*, to appear in Mich. Math. J.

[17] M. Miller and B. Ozbagci, *Lefschetz fibrations on nonorientable 4-manifolds*, Pac. J. Math. **312**(1):177–202, 2021.

[16] M. Miller and P. Naylor, *Trisections of non-orientable 4-manifolds*, to appear in Mich. Math. J.

[15] M. Miller and A. Zupan, *Equivalent characterizations of handle-ribbon knots*, to appear in Commun. Anal. Geom.

[14] P. Aceto, J. Meier, A. N. Miller, M. Miller, JH. Park, and A. I. Stipsicz, *Branched covers bounding rational homology balls*, Algebr. Geom. Topol. **21**(7):3569–3599, 2021.

[13] A. Juhász, M. Miller, and I. Zemke, *Transverse invariants and exotic surfaces in the 4-ball*, Geom. Topol. **25**(6):2963–3012, 2021.

[12] M. R. Klug and M. Miller, *Concordance of surfaces and the Freedman-Quinn invariant*, J. Topol. **14**(2):560–586, 2021.

[11] N. A. Castro, G. Islambouli, M. Miller, and M. Tomova, *The relative $\mathcal{L}$-invariant of a compact 4-manifold*, Pac. J. Math. **315**(2):305–346, 2021.

[10] I. Dai and M. Miller, *The 0-concordance monoid is infinitely generated*, Proc. Amer. Math. Soc. **151**(8):3601–3609, 2023.

Papers and Preprints (continued)

[9] M. Miller, *The effect of link Dehn surgery on the Thurston norm*, to appear in Int. Math. Res. Not. IMRN.

[8] A. Juhász, M. Miller, and I. Zemke, *Knot cobordisms, torsion, and Floer homology*, J. Topol. **13**(4):1701–1724, 2020.

[7] P. Lambert-Cole and M. Miller, *Trisections of 5-manifolds*, 2019 MATRIX Annals, MATRIX Book Ser., Springer, pp. 117–134, 2021.

[6] M. Miller and I. Zemke, *Knot Floer homology and strongly homotopy-ribbon concordances*, Math. Res. Lett. **28**(3):849–861, 2021.

[5] M. Miller, *A concordance analogue of the* 4*-dimensional light bulb theorem* Int. Math. Res. Not. IMRN **2021**(4):2565–2587, 2021.

[4] M. C. Hughes, S. Kim, and M. Miller, *Isotopies of surfaces in 4-manifolds via banded unlink diagrams*, Geom. Topol. **24**(3):1519–1569, 2020.

[3] M. Miller, *Extending fibrations on knot complements to ribbon disk complements*, Geom. Topol. **25**(3):1479–1550, 2021.

[2] S. Kim and M. Miller, *Trisections of surface complements and Price twist*, Algebr. Geom. Topol. **20**(1):343–373, 2020.

[1] M. Miller, *Concordances from the standard surface in* $S^2 \times S^2$, J. Knot Theory Ramifications **29**(9):1950–57, 2019.

Selected Invited Talks

I have a full list of both past and upcoming invited talks available on my website with URLs to abstracts when available.

Spring 2024	"Rolling, twisting, and branching," UVA Mathematics Colloquium
	"Surfaces from 3D to 4D," Sungkyunkwan University Math Colloquium
	"Fibered knots vs. 4D conjectures," Math Science Lectures in Honor of Raoul Bott at Harvard University, CMSA
Fall 2023	"Splitting in S^4," UCLA Mathematics Colloquium
Summer 2023	"Splitting spheres in S^4," Gauge Theory and Topology at Oxford
Spring 2023	"Obstructing sliceness of knots," University of Michigan Math Colloquium
Fall 2022	"Obstructing isotopy with an extra dimension," BYU Math Colloquium
	"Stong's KM Invariant," 4-Manifolds: from Above and Below at CIRM
Summer 2022	"Non-isotopic Seifert surfaces," Frontiers in Geometry and Topology at the Abdus Salam International Centre for Theoretical Physics
Spring 2022	"Building concordances and knotted handlebodies," PIMS Rising Stars Colloquium at UBC
	"Knotted handlebodies," University of Chicago Mathematics Colloquium
Fall 2021	"Concordance of surfaces," UC Berkeley Mathematics Colloquium
	"Exotic surfaces in the 4-ball," Rice University Mathematics Colloquium
	"Concordance of Lightbulbs," Stanford Mathematics Colloquium