

Peter Smillie

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Research Interests

I am a differential geometer working on topics surrounding harmonic maps and Teichmüller theory. I like moduli spaces of geometric structures, and particularly like geometric structures on moduli spaces.

Positions and grants

W2 Research Group Leader, MPI MiS, Leipzig, since 2024

W1-Juniorprofessor “Geometry plus”, Universität Heidelberg, 2022-2024

Research project “Organic Materials by Geometrical Design,” Heidelberg Institute for Theoretical Studies, 2022-2024

Bateman Research Instructor, Caltech, 2019 - 2022

Visitor, IHES. Fa. 2018.

NSF Graduate Research Fellowship, 2011- 2014

Education

Ph.D. Mathematics, Harvard University. June 2018.

Advisor: Shing-Tung Yau

B.S. Mathematics, Stanford University, 2011.

Papers and preprints

Riesterer, J.M.; Smillie, P.; *Harmonic maps to Hadamard spaces, and a universal higher Teichmüller space*. arXiv: 2511.11469 (2025)

Sagman, N.; Smillie, P.; *Local asymptotics for Hitchin’s equations and high energy harmonic maps*. Mathematische Annalen 394 (1) (2026)

Smillie, J.; Smillie, P.; Weiss, B.; Ygouf, F.; *Horospherical dynamics in invariant subvarieties..* Advances in mathematics. 451 (2024)

Goedgebeur, J.; Engel, P.; Smillie, P. *Exact enumeration of fullerenes* Duke Math. J. 174 (3) 575 - 613, 15 February 2025

Sagman, N.; Smillie, P. *Unstable minimal surfaces in symmetric spaces of non-compact type*. To appear in Annals of Mathematics.

Bonsante, F.; Seppi, A.; Smillie, P. *Completeness of convex entire surfaces in Minkowski 3-space*. J. Differential Geom., 133(2):207–274, 2026

Markovic, V.; Sagman, N.; Smillie, P. *Unstable minimal surfaces in $\mathbb{R}^n$ and in products of hyperbolic surfaces*. Comment. Math. Helv. 100 (2025), no. 1, pp. 93–121.

Bonsante, F.; Seppi, A.; Smillie, P. *Complete CMC hypersurfaces in Minkowski $(n+1)$ -space*. Comm. Anal. Geom. 31 (2023) 4, 799-845.

Bonsante, F.; Seppi, A.; Smillie, P. *The Minkowski problem in regular domains*. Math. Ann. 374, Issue 3-4 (2019), 1261-1309.

Bux, K.-U.; Smillie, P; Vogtmann, K. *On the bordification of outer space*. J. London Math Soc. 98, Issue 1 (2018), 12-34.

Engel, P.; Smillie, P. *The number of convex tilings of the sphere by triangles, squares, or hexagons*. Geom. Topology. 22, No. 5 (2018), 2839-2864.

Teaching

Ringvorlesung: harmonic maps, MPI Leipzig, Fa. 2024

Minicourse: Siegel-Weil formula, Le Teich, March 2024

Differential geometry I, Heidelberg, Sum. 2023

Seminar: Minimal surfaces, Heidelberg, Win. 2022

109c: Differential topology, Caltech, Spr 2022

Complex geometry, Caltech, Win. 2022

Harmonic maps and integrable systems, Caltech, Spr 2021

109b: Differential geometry of surfaces, Caltech, Win. 2020 and Win. 2021

109a: Introduction to topology, Caltech, Fa. 2020

Harmonic maps, Caltech, Fa. 2019

Minimal Surfaces, Caltech, Spr. 2019

157a: Riemannian Geometry, Caltech, Win. 2019, Win. 2020, and Fa. 2021

21a: Multivariable Calculus, Harvard, Fa. 2014, Fa. 2015, Spr. 2016, Fa. 2017

Course Assistant, *Differential Geometry*, National Taiwan University, Fa. 2013 - Spr. 2014

Course Assistant, *213br: Advanced Complex Analysis*, Harvard, Spr. 2013

Mentorship

Max Riestenberg, postdoc at MPI MiS, 2025-2026.

Davide Trevisan, master's these at U. Leipzig, 2026.

Andrea Donati, master's thesis at U. Torino (co-supervised), 2026. Subject: minimal Lagrangians.

Marcel Eichberg, master's thesis at Heidelberg, 2023-2024. Title: *Non-negatively curved triangulations of the sphere*.

Alexander Baucke, Heidelberg experimental geometry lab (HEGL) independent project 2023. Topic: *Penrose tilings of closed surfaces*.

Julia Piazzolo, bachelor's thesis at Heidelberg, 2023. Topic: *Index of minimal surfaces*.

Miles Cua, SURF summer undergraduate research at Caltech, 2021. Topic: *Harmonic maps and the null support function*.

Enya Hsiao, Laura Lankers, Nat Kendall-Freedman; Ph.D. mentor at MPI MiS (n.b. this is a smaller role than Ph.D. advisor)