

OLIVER GROSS | CURRICULUM VITÆ

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I use geometry to make difficult problems in simulation, optimization, and design tractable. Drawing on differential geometry, topology, geometric mechanics, and numerical optimization, I uncover the structures governing admissible state spaces and encode them directly in models and algorithms. Across plasma physics, animal and robotic locomotion, and shape optimization, this explanatory and constructive approach makes simulation a trustworthy engine for discovering equilibria, controlling motion, and designing physically realizable forms and behaviors.

ACADEMIC APPOINTMENTS

UNIVERSITY OF CALIFORNIA SAN DIEGO <i>Postdoctoral researcher</i> Prof. Albert Chern Computer Science and Engineering	LA JOLLA, CA, USA 03/2025 – present
EPFL <i>Postdoctoral researcher</i> Prof. Mark Pauly School of Computer and Communication Sciences	LAUSANNE, SWITZERLAND 09/2024 – 02/2025
CALIFORNIA INSTITUTE OF TECHNOLOGY <i>Visiting graduate researcher</i> Prof. Peter Schröder Computing + Mathematical Sciences	PASADENA, CA, USA 01/2023 – 07/2023
TECHNICAL UNIVERSITY BERLIN <i>Research assistant</i> Prof. Ulrich Pinkall DFG SFB/TRR 109 “Discretization in Geometry and Dynamics” Berlin Mathematical School, MATH+ Cluster of Excellence	BERLIN, GERMANY 07/2020 – 06/2024

EDUCATION

TECHNICAL UNIVERSITY BERLIN <i>Ph.D. in Mathematics</i> <i>summa cum laude</i> Prof. Ulrich Pinkall & Prof. Peter Schröder <i>M.Sc. in Mathematics</i> Prof. Ulrich Pinkall <i>B.Sc. in Mathematics</i> Prof. Ulrich Pinkall	BERLIN, GERMANY 07/2020 – 05/2024 10/2018 – 06/2020 04/2015 – 01/2019
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SELECTED DISTINCTIONS & LEADERSHIP

○ Book Impact ranked #7 of 7,500+ Springer mathematics textbooks by online downloads	2026
○ ACM SIGGRAPH Technical Papers Committee 2026	
○ ACM SIGGRAPH Asia Technical Papers Committee 2026 Technical Papers COI Coordinator 2025	
○ Eurographics International Program Committee 2027	
○ 12th Heidelberg Laureate Forum Selected Young Researcher	2025
○ 10th Heidelberg Laureate Forum Selected Young Researcher	2023

PUBLICATIONS

*indicates joint first authorship, ^α indicates authors are listed aequo loco and alphabetically, [‡] student supervised/co-supervised

JOURNAL ARTICLES	
(Semi-)Invariant Curves from Centers of Triangle Families <i>K. Mundilova and O. Gross</i> Comput. Aided Geom. Des., Vol. 129 (2026): 102587 [Code]	2026 DOI: 10.1016/j.cagd.2026.102587
Elastic Curves with Variable Bending Stiffness <i>O. Gross^α, U. Pinkall and M. Wahl^{α,‡}</i> Studies in Appl. Math. 155, no. 2 (2025): 155, e70097	2025 DOI: 10.1111/sapm.70097
Inverse Geometric Locomotion <i>Q. Becker*, O. Gross*, and M. Pauly</i> ACM Trans. Graph. 44, 4, Article 141 SIGGRAPH 2025 [Code]	2025 DOI: 10.1145/3731187
Force-Free Fields are Conformally Geodesic <i>A. Chern^α and O. Gross^α</i> SIAM J. Appl. Algebra Geom. Vol. 8, No. 4, pp. 1001–1022	2024 DOI: 10.1137/23M1583211
Going with the Flow <i>Y. Soliman, M. Padilla, O. Gross, F. Knöppel, U. Pinkall, and P. Schröder</i> ACM Trans. Graph. 43, 4, Article 57 SIGGRAPH 2024 [Code]	2024 DOI: 10.1145/3658164

Plasma Knots 2023
O. Gross, U. Pinkall, and P. Schröder
Phys. Lett. A Volume 480 (2023): 128986 DOI: [10.1016/j.physleta.2023.128986](https://doi.org/10.1016/j.physleta.2023.128986)

Motion from Shape Change 2023
O. Gross, Y. Soliman, M. Padilla, F. Knöppel, U. Pinkall and P. Schröder
ACM Trans. Graph. 42, 4, Article 107 | SIGGRAPH 2023 | [\[Code\]](#) DOI: [10.1145/3592417](https://doi.org/10.1145/3592417)

Filament Based Plasma 2022
M. Padilla, O. Gross*, F. Knöppel, A. Chern, U. Pinkall, and P. Schröder*
ACM Trans. Graph. 41, 4, Article 153 | SIGGRAPH 2022 | [\[Code\]](#) DOI: [10.1145/3528223.3530102](https://doi.org/10.1145/3528223.3530102)

BOOKS

Differential Geometry: From Elastic Curves to Willmore Surfaces 2024
U. Pinkall and O. Gross
Birkhäuser Compact Textbooks in Mathematics DOI: [10.1007/978-3-031-39838-4](https://doi.org/10.1007/978-3-031-39838-4)

PREPRINTS

Elastic Curves via Geometric Mechanics 2026
O. Gross, R. Jammula*,[‡] and A. Chern* | under review at ACM Trans. Graph. arXiv: [2607.29654](https://arxiv.org/abs/2607.29654)

Vakonomic Fluids 2026
R. Roy-Chowdhury,[‡] M. S. Nabizadeh*, O. Gross, A. Gruber, and A. Chern* | under review at J. Nonlinear Sci. arXiv: [2607.18312](https://arxiv.org/abs/2607.18312)

Sub-Riemannian Boundary Value Problems for Optimal Geometric Locomotion 2026
O. Gross, F. Hartwig*, M. Rumpf, and P. Schröder* | [\[Code\]](#) | under review at Proc. R. Soc. A arXiv: [2602.12199](https://arxiv.org/abs/2602.12199)

A Variational Approach to Geometric Mechanics for Undulating Robotic Locomotion 2024
S. Even, P. S. Martinez*, C. Keogh, O. Gross, Y. Özkan-Aydın, and P. Schröder* arXiv: [2409.10827](https://arxiv.org/abs/2409.10827)

THESES

Conformal Geometry in Ideal Magnetohydrodynamics 2024
O. Gross | PhD Thesis, Technical University Berlin DOI: [10.14279/depositonce-20666](https://doi.org/10.14279/depositonce-20666)

Ground States of Laplacians on Complex Line Bundles with Constant Curvature 2020
O. Gross | M. Sc. Thesis, Technical University Berlin (available on request)

Approximating Smooth Surfaces by Piecewise Developable Surfaces 2019
O. Gross | B. Sc. Thesis, Technical University Berlin (available on request)

EXPOSITORY WRITING

What It Takes to Film Mathematics 2026
O. Gross DOI: [10.1007/s00283-025-10495-x](https://doi.org/10.1007/s00283-025-10495-x)
The Mathematical Intelligencer 48 (Suppl. 1), 87–93 | Invited article for ICM 2026 Special Issue

GRANTS & FELLOWSHIPS

- **SAP Young Researcher Grant and Travel Grant** | Full funding to attend the 12th Heidelberg Laureate Forum 2025
- **Open Access Book Funding** | TU Berlin Publication Fund and DFG SFB/TRR 109 | €13,000 2023
- **Visiting Graduate Research Fellowship at Caltech** | DFG SFB/TRR 109 | €8,000 2022
- **BMS Research Stay Grant** | Berlin Mathematical School, MATH+ Cluster of Excellence | €5,000 2022
- **DAAD Research Fellowship for Doctoral Students** | four months 2022
- **Kovalevskaya Grant** | with DMV Travel Grant | full funding to attend the ICM 2022 2021

ACADEMIC SERVICE

- **ACM SIGGRAPH** | Technical Papers Reviewer 2025 | Poster Reviewer 2022
- **SIAM Journal on Applied Algebra and Geometry** | Reviewer 2025

TALKS

COLLOQUIA & SEMINARS

Analysis, Dynamics & Applications Seminar | UNIVERSITY OF ARIZONA (scheduled) 12/2026
Applied & Interdisciplinary Mathematics Seminar | UNIVERSITY OF MICHIGAN (scheduled) 11/2026
General Robotics, Automation, Sensing and Perception (GRASP) Seminar | UNIVERSITY OF PENNSYLVANIA (scheduled) 10/2026
Geometry/Topology Seminar | NC STATE UNIVERSITY (scheduled) 10/2026
High-Fidelity Physics Research Group | NVIDIA (scheduled) 09/2026

Computer Science Colloquium UC RIVERSIDE	(scheduled) 09/2026
IPAB Visitor Seminar UNIVERSITY OF EDINBURGH <i>Geometric Methods for Physics Simulation</i>	06/2026
Contextual Robotics Institute UC SAN DIEGO <i>Geometric Methods in Motion Planning</i>	04/2026
Bioinspired Robotics and Design Lab UC SAN DIEGO <i>Geometric Methods in Motion Planning</i>	04/2026
Center for Computing Research (CCR) SANDIA NATIONAL LABORATORIES <i>Geometric Methods for Physics Simulation</i>	04/2026
Pixel Café UC SAN DIEGO <i>Geometric Methods in Motion Planning</i>	04/2026
CIGMO Seminar ONLINE <i>Geometric Methods for Physics Simulation</i>	03/2026
Computational Mathematics & Scientific Computing Seminar NYU COURANT INSTITUTE <i>Geometric Methods for Physics Simulation</i>	12/2025
Soft Math Lab HARVARD UNIVERSITY <i>Geometric Methods for Physics Simulation</i>	10/2025
CRAB Laboratory GEORGIA INSTITUTE OF TECHNOLOGY (ONLINE) <i>Inverse and Optimal Geometric Locomotion</i>	10/2025
CSAIL Visual Computing Seminar MIT <i>Geometric Methods for Physics Simulation</i>	10/2025
Geometry & Graphics Group UNIVERSITY OF SOUTHERN CALIFORNIA <i>Inverse and Optimal Geometric Locomotion</i>	10/2025
Toronto Geometry Colloquium UNIVERSITY OF TORONTO <i>Inverse and Optimal Geometric Locomotion</i>	10/2025
Center for Relativity and Cosmology Seminar TROY UNIVERSITY <i>Force-Free Fields are Conformally Geodesic</i>	10/2025
Graphics Reading Group UNIVERSITY COLLEGE LONDON (ONLINE) <i>Inverse Problems in Geometric Locomotion</i>	06/2025
Geotop-A Web Seminar ONLINE <i>Conformal Geometry in Magnetic Relaxation</i>	03/2025
Applied Mathematics Seminar DURHAM UNIVERSITY (ONLINE) <i>Conformal Geometry in Ideal MHD</i>	03/2025
SPECTaculars' Meeting ONLINE <i>Force-Free Fields are Conformally Geodesic</i>	12/2024
Computer Graphics Seminar IST AUSTRIA <i>Conformal Geodesibility and Ideal MHD</i>	11/2024
Oden Institute Seminar UNIVERSITY OF TEXAS AT AUSTIN <i>Geometric Approaches to Fluid Simulations</i>	02/2024
SFB1060 Colloquium UNIVERSITY OF BONN <i>Shifting Shapes with Shape Shifts</i>	11/2023
Geometric Computing Laboratory EPFL <i>Variational Energies for Curves with Variable Thickness</i>	11/2023
MiniRo Lab UNIVERSITY OF NOTRE DAME (ONLINE) <i>Geometric Mechanics for Physics Simulation</i>	10/2023
Pixel Café UC SAN DIEGO <i>Shifting Shapes with Shape Shifts</i>	07/2023
CMX Student/Postdoc Seminar CALTECH <i>Filament Based Plasma</i>	03/2023
Bellan Plasma Group CALTECH <i>A Geometric Approach to Magnetic Relaxation</i>	02/2023
Pixel Café UC SAN DIEGO <i>Lagrangian Modeling and Geometric Optimization in Plasma Physics</i>	07/2022
Geometry Seminar TU GRAZ <i>Riemannian Geometry in Plasma Physics</i>	05/2022

WORKSHOPS & CONFERENCES.....

◇ invitation-only event

ICERM workshop “Structure-Preserving Scientific Machine Learning” INVITED SPEAKER PROVIDENCE, RI	(scheduled) 06/2027
Discrete Geometric Structures 2026 ◇ VIENNA, AUSTRIA <i>Discrete Elastic Curves from Isoperimetric Problems</i>	08/2026
Scientific Computing and Differential Equations (SciCADE) 2026 EDINBURGH, UK <i>Vakonomic Fluids</i>	07/2026
Brin MRC “Geometric PDE Challenges in Science and Engineering” ◇ INVITED SPEAKER COLLEGE PARK, MD <i>Geometric Methods in Motion Planning</i>	06/2026
State-of-the-Art in Computer Graphics Workshop CHICAGO, IL <i>Sub-Riemannian Geometry in Graphics</i>	03/2026
12th Heidelberg Laureate Forum ◇ HEIDELBERG, GERMANY <i>Inverse and Optimal Geometric Locomotion</i>	09/2025
Geometry Workshop Obergurgl 2025 ◇ INNSBRUCK, AUSTRIA <i>Inverse and Optimal Geometric Locomotion</i>	08/2025
EQUADIFF 2024 KARLSTAD, SWEDEN <i>Geometry of Plasma Knots</i>	06/2024
10th Heidelberg Laureate Forum ◇ HEIDELBERG, GERMANY <i>Motion from Shape Change</i>	09/2023
Geometry Workshop Obergurgl 2023 ◇ INNSBRUCK, AUSTRIA <i>Motion from Shape Change</i>	08/2023
ACM SIGGRAPH 2023 Technical Papers LOS ANGELES, CA <i>Motion from Shape Change</i>	08/2023
The Interdisciplinary World of Tangling 2022 POTSDAM, GERMANY <i>Filament Based Plasma</i>	09/2022
Discrete Geometric Structures 2022 ◇ VIENNA, AUSTRIA <i>Filament Based Plasma</i>	08/2022
ACM SIGGRAPH 2022 Technical Papers VANCOUVER, BC <i>Filament Based Plasma</i>	08/2022
Annual Meeting of the SFB/TRR 109 LANDSHUT, GERMANY <i>Shape of Flux Tubes</i>	09/2021

TEACHING

COURSES & INSTRUCTION.....

3D Elastic Curves from Multiple Perspectives	TECHNICAL UNIVERSITY OF DENMARK
<i>Invited instructor</i> PhD Summer school “Geometry for Digital Fabrication and Architecture”	08/2026
○ Primer on curves and surfaces, calculus of variations, elastica and equivalent characterizations	

Conformal Geometry in Ideal MHD

Invited lecturer | ERC Starting Project GeoFEM

UNIVERSITY OF OXFORD

07/2026

- Ideal MHD, force-free fields, conformal geodesibility, magnetic relaxation

MIT Summer Geometry Initiative (SGI)

MIT

Project mentor | Summer research program for undergraduate students from underrepresented groups

07/2025 – 09/2025

- Geometric models for locomotion, inverse problems for gait design, space-time optimization

Scientific Visualization with Houdini

TU BERLIN

Invited workshop instructor | TechTalks series

12/2023, 04/2024

- Data structures, VEX scripting, modeling and animation workflows, hands-on exercises

Differential Geometry II – Analysis and geometry on manifolds

TU BERLIN

Teaching Assistant | Undergraduate and graduate course

winter term 2020/21

- Manifolds, vector bundles, exterior calculus, Riemannian geometry and calculus on manifolds

Differential Geometry I – Curves and surfaces

TU BERLIN

Teaching Assistant | Undergraduate and graduate course

summer term 2020

- Foundations in curves and surfaces, calculus of variations, elastica, minimal-, cmc- and Willmore surfaces

Calculus I and Linear Algebra for engineering sciences

TU BERLIN

Teaching Assistant | Undergraduate course

2017 – 2019

- Foundations in calculus of one real variable, linear algebra and linear differential equations

TRAINING & PEDAGOGICAL DEVELOPMENT

Central Institution for Scientific Training & Cooperation

TU BERLIN

Completed certification for teaching and communication skills

2017

MENTORSHIP

- Heidelberg Graduate School of Mathematical and Computational Methods for the Sciences:

UNIVERSITY OF HEIDELBERG

External mentor for their PhD student Antonia Stavemann

08/2025 – present

- Mentoring program for newly enrolled mathematics students, summer term 2017, winter term 2017/2018

TU BERLIN

THESIS & PROJECT SUPERVISION

Supervised or co-supervised 12 theses and research projects involving students from the undergraduate through doctoral level across TU Berlin, Caltech, EPFL, UC San Diego, and the University of Notre Dame.

- Ritoban Roy-Chowdhury | *Vakonomic formulation for discrete Euler equations* Undergraduate research project | UC SAN DIEGO
- Rohit Jammula | *Isoperimetric approach to elastic curves* Master's thesis | UC SAN DIEGO
- Azhang Nazarpouya | *Sim-to-Real transfer in motion capture reconstruction (ongoing)* Research project (PhD student) | NOTRE DAME
- Orfeas Liossatos | *Motion planning for shape-changing bodies driven by forces* Master's thesis | EPFL
- Dušan Cvijetić | *Simulating Elastic Rod–Sheet Systems* Semester project in Geometric Computing | EPFL
- Sean Even | *Learning Sim2Real error corrections for geometric integrators* Research project (PhD student) | NOTRE DAME
- Patrick S. Martinez | *Modeling undulating robot locomotion with geometric integrators* Undergraduate research project | CALTECH
- Moritz Wahl | *Elastic curves with variable bending stiffness* Bachelor's thesis | TU BERLIN
- Paulina Liedke | *Constrained Willmore surfaces* Master's thesis | TU BERLIN
- Tim Maruhn | *Coriolis forces in a Riemannian quotient manifold* Bachelor's thesis | TU BERLIN
- Max Wehner | *Rigid body motion in a fluid* Bachelor's thesis | TU BERLIN
- Antonia Stavemann | *Laplace-Beltrami operators on polygonal meshes* Bachelor's thesis | TU BERLIN

SOFTWARE

- **Programming** | Python (PyTorch, Polyscope), Matlab, Houdini VEX
- **Visualization** | SideFX Houdini, Blender, Affinity Suite

OUTREACH & PRESS

- **Intercultural Science-Art Exhibition “People of Mathematics”** | Participating artist 2026
- **Intercultural Science-Art Project “Heirs of infinity”** | Participating artist 2025
- **Spektrum.de SciLogs** | “Posters of Progress: All Eyes on the Young Researchers Taking the Stage” 10/2023
- **IEEE Spectrum** | “Cracking the Puzzle of Serpentine Motion” 08/2023
- **Research visualizations** | Figures for *Non-Euclidean Laguerre Geometry and Incircular Nets* (Springer, 2021) | German Research Foundation calendar 2023 | Holiday cards for Caltech President 2023 and Birkhäuser publisher 2024
- **DGD-Calendar** | Co-editor of a mathematical calendar 2020 – 2024

REFERENCES

Prof. Ulrich Pinkall

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Prof. Peter Schröder

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