


Academic CV Dr. rer. nat. Dirk Peschka



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Profile

- Personal**  Born 21 November 1977 in Zossen; German citizen; married, two daughters.
- Role and focus**  Researcher at the Weierstrass Institute for Applied Analysis and Stochastics in Berlin. My work connects applied analysis, numerical simulation, and modelling for problems in mathematics, physics, and engineering, with a particular emphasis on continuum mechanics and nonequilibrium thermodynamics.

Research. variational modelling · structure-preserving discretisation · free-boundary problems · continuum mechanics · higher-order nonlinear PDEs · generalized gradient flows










Application. wetting and interfacial flows · soft and complex matter · multiphysics transport · porous media · phase separation and transition · biomedical modelling

Numerics. finite element method · ALE methods for moving domains · Eulerian and Lagrangian formulations · sharp and diffuse interface methods · model reduction & asymptotics





Transfer and software. research software in Python, Julia, MATLAB and C++ · finite-element libraries FEniCS and deal.II · WIAS-FEniCS user meeting · software & data seminar · material modelling seminar · interdisciplinary cooperation · institutional transfer formats

Institutional. good scientific practice as ombudsperson · research software and research data · institutional use of AI systems · resource coordination and infrastructure development

Research History











- 2023 – current  **Principal Investigator in DFG SPP 2171.** PI, own position, in SPP 2171, second funding period.
- 2023  **Substitute Professor,** Freie Universität Berlin.
- 2019 – 2023  **Principal Investigator in DFG SPP 2171.** PI, own position, in SPP 2171, first funding period.
- 2014 – 2019  **Research Associate at the Einstein Center for Mathematics.** DFG Research Center MATHEON, projects OT1 and OT8 on semiconductor lasers; elected representative of researchers on the MATHEON Executive Board.
- 2010, 2011, 2012, 2014  **Visiting Scholar,** University of California Los Angeles. Theory, simulation and experiments of suspension flows with Andrea Bertozzi; mentor of REU project and lab manager at the UCLA Applied Math Lab.
- 2010 – 2014  **Research Associate in the DFG Research Center MATHEON.** Researcher in Project C10 on surface phenomena with Barbara Wagner.
- 2010 – 2016  **Principal Investigator in DFG SPP 1506.** Co-PI in SPP project over two funding periods with Ralf Seemann and Barbara Wagner.
- 2008 – 2010  **Research Associate in industry project with Océ/Canon.** Research on flow instabilities for innovative printer designs; collaboration with Eberhard Bänsch.
- 2005 – 2008  **Ph.D. in DFG Research Training Group GRK 1128.** *Analysis, Numerics and Optimization of Multiphase Problems*; advisors Andreas Münch & Barbara Nithammer.

Education

- 2008  **Ph.D. (Dr. rer. nat.) in Mathematics**, Institut für Mathematik, Humboldt-Universität zu Berlin.
Thesis title: *Analysis of thin films with slippage*.
- 2005 – 2008  **Scholarship, DFG Research Training Group 1128**, *Analysis, Numerics, and Optimization of Multiphase Problems*.
- 2004 – 2005  **Scholarship, DFG Research Training Group 271/3-02**, *Strukturuntersuchungen, Präzisionstests und Erweiterung des Standardmodells der Elementarteilchenphysik*.
- 2004  **Diploma (Dipl.-Phys.) in Physics**, Institut für Physik, Humboldt-Universität zu Berlin.
Thesis title: *On the semiclassical structure of QCD–A lattice study at finite temperature*.

Research Publications

Ten Important Publications

- 1 A. K. Giri, P. Margaretti, **D. Peschka**, and M. Sega, “Resolving the microscopic hydrodynamics at the moving contact line,” *Physical Review Fluids*, vol. 7, p. L102001, 10 2022.  DOI: 10.1103/PhysRevFluids.7.L102001
- 2 L. Schmeller and **D. Peschka**, “Gradient flows for coupling order parameters and mechanics,” *SIAM Journal on Applied Mathematics*, vol. 83, no. 1, pp. 225–253, 2023.  DOI: 10.1137/22M148478X
- 3 **D. Peschka** and L. Heltai, “Model hierarchies and higher-order discretisation of time-dependent thin-film free boundary problems with dynamic contact angle,” *Journal of Computational Physics*, p. 111 325, 2022.  DOI: 10.1016/j.jcp.2022.111325
- 4 A. Zafferi, **D. Peschka**, and M. Thomas, “GENERIC framework for reactive fluid flows,” *Zeitschrift für Angewandte Mathematik und Mechanik*, e202100254, 2021.  DOI: 10.1002/zamm.202100254
- 5 **D. Peschka**, S. Haefner, L. Marquant, K. Jacobs, A. Münch, and B. Wagner, “Signatures of slip in dewetting polymer films,” *Proceedings of the National Academy of Sciences*, vol. 116, no. 19, pp. 9275–9284, 2019.  DOI: 10.1073/pnas.1820487116
- 6 **D. Peschka**, “Thin-film free boundary problems for partial wetting,” *Journal of Computational Physics*, vol. 295, pp. 770–778, 2015.  DOI: 10.1016/j.jcp.2015.04.041
- 7 N. Murisic, B. Pausader, **D. Peschka**, and A. Bertozzi, “Dynamics of particle settling and resuspension in viscous liquid films,” *Journal of Fluid Mechanics*, vol. 717, pp. 203–231, 2013.  DOI: 10.1017/jfm.2012.567
- 8 **D. Peschka**, “Variational approach to contact line dynamics for thin films,” *Physics of Fluids*, vol. 30, no. 8, p. 082 115, 2018.  DOI: 10.1063/1.5040985
- 9 P. Farrell and **D. Peschka**, “Nonlinear diffusion, boundary layers and nonsmoothness: Analysis of challenges in drift–diffusion semiconductor simulations,” *Computers & Mathematics with Applications*, vol. 78, no. 12, pp. 3731–3747, 2019.  DOI: 10.1016/j.camwa.2019.06.007
- 10 L. Adam, M. Hintermüller, **D. Peschka**, and T. Surowiec, “Optimization of a multiphysics problem in semiconductor laser design,” *SIAM Journal on Applied Mathematics*, vol. 79, no. 1, pp. 257–283, 2019.  DOI: 10.1137/18M1179183

Journal Publications

- 1 A. Erhardt et al., “Modeling cellular self-organization in strain-stiffening hydrogels,” *Computational Mechanics*, vol. 75, no. 2, pp. 875–896, 2025.
- 2 K. Remini, L. Schmeller, **D. Peschka**, B. Wagner, and R. Seemann, “Exploring the gap between theory and experiment at the three-phase contact line of polystyrene droplets on soft PDMS,” *Scientific Reports*, 2025.
- 3 L. Schmeller and **D. Peschka**, “Sharp-interface limits of Cahn–Hilliard models and mechanics with moving contact lines,” *Multiscale Modeling & Simulation*, vol. 22, no. 2, pp. 869–890, 2024. [DOI: dx.doi.org/10.1137/23M1546592](https://doi.org/10.1137/23M1546592)
- 4 L. Giacomelli, M. V. Gnann, and **D. Peschka**, “Droplet motion with contact-line friction: Long-time asymptotics in complete wetting,” *Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences*, vol. 479, no. 2274, p. 20230090, 2023. [DOI: 10.1098/rspa.2023.0090](https://doi.org/10.1098/rspa.2023.0090)
- 5 **D. Peschka**, “Partial and complete wetting of thin films with dynamic contact angle,” *Physics of Fluids*, vol. 35, no. 4, 2023.
- 6 R. Shiri, L. Schmeller, **D. Peschka**, R. Seemann, and B. Wagner, “Impact of noise on spinodal dewetting of liquid-liquid films,” *Communications Physics*, vol. 6, no. 1, p. 109, 2023.
- 7 A. Zafferi, K. Huber, **D. Peschka**, J. Vrijmoed, T. John, and M. Thomas, “A porous-media model for reactive fluid–rock interaction in a dehydrating rock,” *Journal of Mathematical Physics*, vol. 64, no. 9, p. 091504, Sep. 2023, ISSN: 0022-2488. [DOI: 10.1063/5.0148243](https://doi.org/10.1063/5.0148243)
- 8 **D. Peschka**, A. Zafferi, L. Heltai, and M. Thomas, “Variational approach to fluid-structure interaction via GENERIC,” *Journal of Non-Equilibrium Thermodynamics*, vol. 47, no. 2, pp. 217–226, 2022. [URL: https://doi.org/10.1515/jnet-2021-0081](https://doi.org/10.1515/jnet-2021-0081)
- 9 **D. Peschka**, S. Bommer, S. Jachalski, R. Seemann, and B. Wagner, “Impact of energy dissipation on interface shapes and on rates for dewetting from liquid substrates,” *Scientific Reports*, vol. 8, no. 1, p. 13295, 2018. [DOI: 10.1038/s41598-018-31418-1](https://doi.org/10.1038/s41598-018-31418-1)
- 10 **D. Peschka**, N. Rotundo, and M. Thomas, “Doping optimization for optoelectronic devices,” *Optical and Quantum Electronics*, vol. 50, no. 3, p. 125, 2018.
- 11 **D. Peschka**, N. Rotundo, and M. Thomas, “Towards doping optimization of semiconductor lasers,” *Journal of Computational and Theoretical Transport*, vol. 45, no. 5, pp. 410–423, 2016.
- 12 **D. Peschka** et al., “Robustness analysis of a device concept for edge-emitting lasers based on strained germanium,” *Optical and Quantum Electronics*, vol. 48, no. 2, p. 156, 2016.
- 13 R. Huth, S. Jachalski, G. Kitavtsev, and **D. Peschka**, “Gradient flow perspective on thin-film bilayer flows,” *Journal of Engineering Mathematics*, vol. 94, no. 1, pp. 43–61, 2015.
- 14 **D. Peschka** et al., “Modeling of edge-emitting lasers based on tensile strained germanium microstrips,” *IEEE Photonics Journal*, vol. 7, no. 3, pp. 1–15, 2015.
- 15 S. Jachalski, **D. Peschka**, A. Münch, and B. Wagner, “Impact of interfacial slip on the stability of liquid two-layer polymer films,” *Journal of Engineering Mathematics*, vol. 86, no. 1, pp. 9–29, 2014. [DOI: 10.1007/s10665-013-9651-8](https://doi.org/10.1007/s10665-013-9651-8)
- 16 S. Bommer, F. Cartellier, S. Jachalski, **D. Peschka**, R. Seemann, and B. Wagner, “Droplets on liquids and their journey into equilibrium,” *The European Physical Journal E*, vol. 36, no. 8, p. 87, 2013. [DOI: 10.1140/epje/i2013-13087-x](https://doi.org/10.1140/epje/i2013-13087-x)
- 17 S. Jachalski, R. Huth, G. Kitavtsev, **D. Peschka**, and B. Wagner, “Stationary solutions of liquid two-layer thin-film models,” *SIAM Journal on Applied Mathematics*, vol. 73, no. 3, pp. 1183–1202, 2013.

- 18 J. Schmidt et al., “Conductivity in nonpolar media: Experimental and numerical studies on sodium AOT–hexadecane, lecithin–hexadecane and aluminum (III)-3, 5-diisopropyl salicylate–hexadecane systems,” *Journal of Colloid and Interface Science*, vol. 386, no. 1, pp. 240–251, 2012.
- 19 K. Kostourou, **D. Peschka**, A. Münch, B. Wagner, S. Herminghaus, and R. Seemann, “Interface morphologies in liquid/liquid dewetting,” *Chemical Engineering and Processing: Process Intensification*, vol. 50, no. 5-6, pp. 531–536, 2011.
- 20 **D. Peschka**, A. Münch, and B. Niethammer, “Self-similar rupture of viscous thin films in the strong-slip regime,” *Nonlinearity*, vol. 23, no. 2, p. 409, 2010.
- 21 **D. Peschka**, A. Münch, and B. Niethammer, “Thin-film rupture for large slip,” *Journal of Engineering Mathematics*, vol. 66, no. 1-3, pp. 33–51, 2010.
- 22 E. Ilgenfritz, M. Müller-Preussker, and **D. Peschka**, “Calorons in SU(3) lattice gauge theory,” *Physical Review D*, vol. 71, no. 11, p. 116 003, 2005.

Preprints

- 1 **D. Peschka** and T. Roubíček, “A poro-visco-elastodynamic model in eulerian formulation, its analysis, implementation, and application to phase transitions in the hydrated earth’s mantle,” *WIAS Preprint 3258*, pp. 1–26, 2026. [DOI: dx.doi.org/10.20347/WIAS.PREPRINT.3258](https://doi.org/10.20347/WIAS.PREPRINT.3258)
- 2 S. Zندهroud et al., “Combined effects of evaporation, sedimentation and solute crystallization on the dynamics of aerosol size distributions on multiple length and time scales,” *WIAS Preprint 3256*, pp. 1–21, 2026. [DOI: dx.doi.org/10.20347/WIAS.PREPRINT.3256](https://doi.org/10.20347/WIAS.PREPRINT.3256)
- 3 Z. Amer et al., “Modeling hydrogen embrittlement for pricing degradation in gas pipelines,” *WIAS Preprint 3201*, pp. 1–19, 2025. [DOI: dx.doi.org/10.20347/WIAS.PREPRINT.3201](https://doi.org/10.20347/WIAS.PREPRINT.3201)
- 4 J. Li, X. Liu, and **D. Peschka**, “Local well-posedness and global stability of one-dimensional shallow water equations with surface tension and constant contact angle,” *arXiv preprint arXiv:2401.03911*, 2024. [DOI: dx.doi.org/10.20347/WIAS.PREPRINT.3084](https://doi.org/10.20347/WIAS.PREPRINT.3084)
- 5 **D. Peschka** and M. Rosenau, “Two-phase flows for sedimentation of suspensions,” *WIAS Preprint 2743*, pp. 1–19, 2020. [DOI: dx.doi.org/10.20347/WIAS.PREPRINT.2743](https://doi.org/10.20347/WIAS.PREPRINT.2743)

Proceedings and Book Chapters












- 1 A. Zafferi and **D. Peschka**, “Variational modeling of porosity waves,” *PAMM*, vol. 26, no. 1, e70065, 2026.
- 2 **D. Peschka**, M. Thomas, and A. Zafferi, “Reference map approach to eulerian thermomechanics using generic,” in *Advances in Continuum Physics: In Memoriam Wolfgang Dreyer*, Springer, 2025, pp. 39–70.
- 3 **D. Peschka**, M. Thomas, T. Ahnert, A. Münch, and B. Wagner, “Gradient structures for flows of concentrated suspensions,” in *Topics in Applied Analysis and Optimisation*, Springer, 2019, pp. 295–318.
- 4 S. Jachalski, **D. Peschka**, S. Bommer, R. Seemann, and B. Wagner, “Structure formation in thin liquid-liquid films,” in *Transport Processes at Fluidic Interfaces*, Springer, 2017, pp. 531–574.
- 5 A. Mielke, **D. Peschka**, N. Rotundo, and M. Thomas, “On Some Extension of Energy-Drift-Diffusion Models: Gradient Structure for Optoelectronic Models of Semiconductors,” in *European Consortium for Mathematics in Industry*, vol. 26, Springer, 2016, pp. 291–298.
- 6 G. Capellini et al., “Modeling of an Edge-Emitting strained-Ge laser,” in *Advanced Solid State Lasers*, Optical Society of America, 2015, ATu2A–19.
- 7 **D. Peschka**, “Numerics of contact line motion for thin films,” *IFAC-PapersOnLine*, vol. 48, no. 1, pp. 390–393, 2015.

- 8 F. Bruckmann et al., “Calorons with non-trivial holonomy on and off the lattice,” *Nuclear Physics B (Proc. Suppl.)*, vol. 140, pp. 635–646, 2005.
- 9 C. Gattringer et al., “Searching for KvBLL calorons in SU(3) lattice gauge field ensembles,” *Nuclear Physics B (Proc. Suppl.)*, no. 129–130, pp. 653–658, 2004.












Selected Data, Software, Research Software Development

- 1 **D. Peschka** and A. Erhardt, *FEniCS Continuation Toolbox*, [Software], Keywords: numerical bifurcation analysis, PDEs. [URL: https://github.com/dpeschka/continuation-fenics](https://github.com/dpeschka/continuation-fenics)
- 2 E. Ipocoana, **D. Peschka**, and M. Thomas, *Model for evaporation of water and with three phases (liquid, crystal, vapor) and a solute concentration*, [Software], Keywords: phase field, molecular dynamics, evaporation and crystallization, 2026. [URL: https://github.com/dpeschka/evaporating-droplet](https://github.com/dpeschka/evaporating-droplet)
- 3 **D. Peschka**, *mini-workshop: AI-assisted scientific computing*, [Presentation], Keywords: Leibniz MMS Days, 2026. [DOI: 10.5281/zenodo.19485146](https://doi.org/10.5281/zenodo.19485146)
- 4 A. Zafferi and **D. Peschka**, *Porosity waves*, [Software], Keywords: nonlinear poro-visco-elasticity, Eulerian, geoscience, 2026. [URL: https://github.com/Andrea-zafferi/Fenics_porosity_waves](https://github.com/Andrea-zafferi/Fenics_porosity_waves)
- 5 **D. Peschka**, *Fluid-structure interaction and wetting of soft polymer substrates*, [Presentation], Keywords: Leibniz MMS Days, 2025. [DOI: 10.5281/zenodo.15101691](https://doi.org/10.5281/zenodo.15101691)
- 6 A. H. Erhardt et al., *Modeling cellular self-organization in strain-stiffening hydrogels*, [Software], Keywords: agent-based model, cell migration, hydrogels, 2024. [URL: https://github.com/andreerhardt/hydrogel_abm](https://github.com/andreerhardt/hydrogel_abm)
- 7 L. Schmeller and **D. Peschka**, *Sharp-interface limits of Cahn–Hilliard models and mechanics with moving contact lines*, [Data], Keywords: sharp interface limit, fluid structure interaction, 2024. [DOI: 10.5281/zenodo.10736588](https://doi.org/10.5281/zenodo.10736588)
- 8 L. Schmeller and **D. Peschka**, *Gradient flows for coupling order parameters and mechanics*, [Software], Keywords: gradient flows, phase field, discretization, 2023. [URL: https://github.com/schmellerl/gradient_flows_order_parameters_mechanics](https://github.com/schmellerl/gradient_flows_order_parameters_mechanics)
- 9 L. Heltai and **D. Peschka**, *Thin-film free boundary problems with dynamic contact angle*, [Software], Keywords: thin films, deal.ii, MATLAB, moving contact lines, higher-order discretization, 2022. [URL: https://github.com/luca-heltai/thin-film-precursor-model](https://github.com/luca-heltai/thin-film-precursor-model)
- 10 L. Schmeller and **D. Peschka**, *Benchmark: Axisymmetric liquid droplets on viscoelastic substrates*, [Data], Keywords: simulation benchmark, elastocapillarity, 2022. [DOI: 10.5281/zenodo.6556858](https://doi.org/10.5281/zenodo.6556858)
- 11 L. Schmeller and **D. Peschka**, *Data supplement for “Gradient flows for coupling order parameters and mechanics”*, [Data], Keywords: benchmark, phase fields, gradient flow, 2022. [DOI: 10.5281/zenodo.5832661](https://doi.org/10.5281/zenodo.5832661)
- 12 R. Shiri, L. Schmeller, **D. Peschka**, R. Seemann, and B. Wagner, *Spinodal dewetting of liquid-liquid thin-films*, [Data], Keywords: simulation data, experimental data, AFM, spinodal dewetting, 2022. [DOI: 10.5281/zenodo.7755426](https://doi.org/10.5281/zenodo.7755426)
- 13 P. Farrell and **D. Peschka**, *Comparison of different discretization methods for semiconductor drift-diffusion problems*, Dataset, Keywords: finite volume method, finite element method, simulation benchmark, semiconductors, drift-diffusion, 2018. [DOI: 10.20347/WIAS.DATA.3](https://doi.org/10.20347/WIAS.DATA.3)
- 14 **D. Peschka**, *A MATLAB algorithms for thin-film free boundary problems in one spatial dimension*, [Software], Keywords: thin films, moving contact lines, MATLAB, 2015. [URL: https://github.com/dpeschka/thinfilm-freeboundary](https://github.com/dpeschka/thinfilm-freeboundary)


Third Party Funding and Proposals

- 2026  **DFG/ANR.** Joint proposal on charged polymer solutions with B. Wagner and R. Blossey, under review.
- 2025  **MATH+.** Proposal on hydrogen embrittlement with F. Handte and M. Thomas, industry partner OGE, not funded.
- 2024  **MATH+.** Workshop funding for “MathBio22” at WIAS.
- 2023  **MATH+.** Proposal on gelation with B. Wagner and W. König, Leibniz/INP, not funded.
- 2022  **DFG SPP 2171 “Dynamic Wetting of Flexible, Adaptive, and Switchable Substrates”.** Successful project extension, own position.
- 2020  **Berlin Mathematics Research Center MATH+.** Successful project proposal for a two-year postdoc position in project AA2-9.
- 2019  **DFG SPP 2171 “Dynamic Wetting of Flexible, Adaptive, and Switchable Substrates”.** Successful project proposal, own position.
 **Berlin Mathematics Research Center MATH+.** Successful proposal for the semester program “Energy-based mathematical methods for reactive multiphase flows”.
 **ECMI Special Interest Group MSOEE.** “Kick-off Meeting” funded by ECMI, with N. Rotundo and P. Farrell.
- 2018  **Berlin Mathematics Research Center MATH+.** Successful project proposal for a two-year postdoc position in project AA2-4.
- 2010 – 2016  **DFG SPP 1506 “Transport processes at fluidic interfaces”.** Successful tandem proposal for two Ph.D. positions with B. Wagner and R. Seemann over two funding periods.



Supervision and Thesis Review

- 2024  **Anant Talasikar**, master thesis, *Asymptotics and numerical simulation of Nernst–Planck–Poisson–Navier–Stokes systems*, TU Berlin.
 **Kingsley Nwokebirinwa**, master thesis, *Frequency dependence of hydrogen embrittlement on the prediction of crack propagation by the Paris law*, FU Berlin.
- running  **Andrea Zafferi**, co-advisor Ph.D. thesis, CRC 1114, advisor Marita Thomas, FU Berlin.
- 2023  **Leonie Schmeller**, co-advisor Ph.D. thesis in SPP 2171, advisor Barbara Wagner, TU Berlin.
 **Dominic Mokbel**, Ph.D. thesis review, *Phase field modeling of ternary fluid–structure interaction problems*, advisor Sebastian Aland, TU Bergakademie Freiberg.
- 2022  **Stefano Piani**, Ph.D. thesis review, *HDG methods and data-driven techniques for the Van Roosbroeck model and its applications*, SISSA, Trieste.
 **Marc Graham**, master thesis with Volker Mehrmann, *Eulerian and Lagrangian Variational Approaches for the Modelling of Viscoelastic Materials*, TU Berlin.
- 2019  **Ornela Mulita**, Ph.D. thesis review, *Smoothed Adaptive Finite Element Methods*, SISSA, Trieste.
- 2015  **Fabian Mönkeberg**, master thesis review, *Asymptotic and Numerical Methods for the Two-Dimensional Narrow Escape Problem for Finite-Size Particles*, TU Berlin.
 **Tobias Ahnert**, co-advisor Ph.D. thesis, *Mathematical modeling of concentrated suspensions*, TU Berlin.
- 2014  **Sebastian Jachalski**, co-advisor and Ph.D. thesis review, *Derivation and Analysis of Lubrication Models for Two-Layer Thin-Films*, TU Berlin.

Scientific Memberships

- GAMM  Member of Gesellschaft für Angewandte Mathematik und Mechanik.

Scientific Memberships (continued)

- DPG  Member of Deutsche Physikalische Gesellschaft.
- MATH+  Member of Berlin Mathematics Research Center MATH+.