

# Short CV and List of Publications

BARBARA WAGNER

## CURRENT ROLE

Head (acting) of Research Group 7

## EDUCATION

- 1995-1999 Habilitation in Mathematics (Dr. rer. nat. habil.),  
Zentrum Mathematik, Technische Universität München
- 1986-1989 Ph.D. in Applied Mathematics (Advisor: Prof. J. D. Cole),  
Dept. Mathematical Sciences, Rensselaer Polytechnic Institute (RPI), NY, USA
- 1983-1985 M.A. in Mathematics,  
Dept. of Mathematics, Washington University, St. Louis, USA

## FURTHER ROLES

Associate Editor *Journal of Engineering Mathematics* since 2011

Member of the scientific board:

*European Conference on Mathematics for Industry (ECMI) 2016*  
*Autumn School on Microstructural Characterization and Modelling of Thin-Film Solar Cells*, 2014 and 2016.

Appointments Committees:

Professorships at the Institute for Mathematics, Technische Universität Berlin;  
External Member, Professorship at Faculty for Mathematics, Informatics and  
Natural Sciences, University of Hamburg

SIAM Prize Committee: *Julian-Cole-Lectureship* (2010)

Deputy Chair of the Advisory Committee of the DFG Research Center MATH-EON, 2008-14

Evaluation of research projects:

invited by the German Research Foundation (DFG), Alexander von Humboldt Foundation, FFG (Austria), NSERC (Canada), Israel Science Foundation, National Research Foundation Singapore

Member of the faculty of the *Berlin Mathematical School*

Member of the *Berlin International Graduate School in Model and Simulation based Research* (BIMoS), Technische Universität Berlin

## AREAS OF RESEARCH

### TOPICS

Mathematical Modelling; Asymptotic Analysis and Numeris for nonlinear PDE's, in particular of high order; Singular Perturbation Methods for Multi-scale Problems; Free Boundary Problems; Phase Field- and Sharp-Interface Models; Stability Analysis; Similarity Methods for Differential Equations and Lie-Groups; Effective Models for the Boltzmann Equation.

### APPLICATION FIELDS

Complex Liquids and Polymers; Suspensions; Active Media; Nano- and Microfluidics, Thin Films; solid and liquid Interfaces; organic/inorganic photoactive Materials; Lithium-Ionen Batteries; Tissue Engineering; Porous Media; Semiconductors; Alloys.

## SUPERVISION OF DOCTORAL STUDENTS AND POSTDOCS

Esteban Meca Alvarez (PostDoc)  
Dirk Peschka (PostDoc),  
Konstantin Afanasiev (PostDoc),  
Peter L. Evans (PostDoc),  
Sibylle Bergmann (Doctoral student),  
Tobias Ahnert (Doctoral student, 2015),  
Marion Dziwnik (Doctoral student (2016), PostDoc),  
Sebastian Jachalski (Doctoral student (2014), PostDoc),  
Maciek Korzec (Doktoral student (2010), PostDoc),  
Ernst Höschele (Doctoral student),  
Georgy Kitavtsev (Doctoral student (2009), PostDoc),  
Viviana Palumberi (Doctoral student, 2009).

## GRANT SUPPORT

GERMAN SCIENCE FOUNDATION (DFG) / FEDERAL MINISTRY OF EDUCATION AND RESEARCH (BMBF) / HELMHOLTZ ASSOCIATION

2013-2018: Project within the Helmholtz Virtual Institute *Microstructure control for thin-film solar cells*, supports one Doctoral student

2014-2017: Project *Mathematical modeling, analysis and novel numerical concepts for anisotropic nanostructured materials*, within ECMath, with Christiane Kraus, Gitta Kutyniok, supports two PostDocs

2010-2016: Project within the DFG Priority Program *Transport at Liquid Interfaces: Structure formation in bi-layer films*, 1st und 2nd Funding Period, with Dirk Peschka, supports 1 Doctoral and one PostDoc.

2010-2014: Project C10 within the DFG Research Center MATHEON: *Modelling, asymptotic analysis and numerical simulation of the dynamics of thin film Nano-structures on crystal surfaces*, supports 1 and 1/2 Postdocs.

2011-2014: Project within the BMBF-Program *Spitzenforschung in den Neuen Ländern PVcomB*, supports 2 Doctoral students and 1/2 Postdoc.

2008-2010: Project within the DFG Priority Program *Nano- and Microfluidics: Mathematical modeling, analysis, numerical simulation of thin films and droplets on rigid and viscoelastic substrates*. Supports one Postdoc.

2006-2010: Project C10 within the DFG Research Center MATHEON: *Modelling, asymptotic analysis and numerical simulation of the dynamics of thin film Nano-structures on crystal surfaces*, (until 2008 together with A. Münch). Supports one Postdocs and one Doctoral position.

2006-2008: Project within the DFG Priority Program *Nano- and Microfluidics: Mathematical modeling, analysis, numerical simulation of thin films and droplets on rigid and viscoelastic substrates*, (until 2008 together with A. Münch). supports one Postdoc.

2005-2009: Member of the DFG Doctoral Training Center *Analysis, Numerics and Optimization of Multiphase Problems*, Humboldt-Universität zu Berlin. supports one Doctoral student.

2005-2006: Project C10 within the DFG Research Center MATHEON: *Modelling, asymptotic analysis and numerical simulation of the dynamics of thin film Nano-structures on crystal surfaces*, together with A. Münch. Funding one Postdoc.

2004-2005: DFG Single Project *Formation of Polymer Films on moving surfaces*, with A. Münch. Supports one Postdoc .

#### PROJECTS FUNDED BY INDUSTRY

2008-2010: Industry Project (Nondisclosure agreement), with A. Münch. Funding one Postdoc

2006-2009: Industry Project (Nondisclosure agreement), with A. Münch. Funding one Doctoral student

## PLENARY TALKS AND SELECTED INVITED TALKS

*last five years (selection)*

2018 Plenary Talk, SIAM Meeting Nonlinear Waves and Coherent Structures, 2018.

2017 Plenary Talk, SIAM Annual Meeting 2017.

2016 BIMoS Day "Multiscale Modeling", Lecture series for the *Berlin International Graduate School in Model and Simulation based Research (BIMoS)*, 8. Feb. 2016.

2015 Oberwolfach-Workshop *New Discretization Methods for the Numerical Approximation of PDEs*, Oberwolfach, 11. - 17. Jan. 2015.

2014 *Unsteady non-uniform base states and their stability*, Plenary Talk at the International Conference on Free Boundary Problems: Theory and Applications, Isaac Newton Institute, Cambridge, 23.- 27. 2014.

*The wavelength of the contact line instability in dewetting rims*, 8th European Conference on Elliptic and Parabolic Problems, 26.-30. May 2014, Gaeta, Italy.

Lecture series *Asymptotic analysis of interfacial evolution* for the BMS Summer School Applied Analysis for Materials, 25. August - 5. September 2014, Berlin.

2013 *Exploring the limits: Evolution equations for interfaces at the nano scales*, Plenary Talk at the 8th DFG-CNRS Workshop: Two-Phase Fluid Flows - Modeling, Analysis and Computational Methods, 6.-8. February 2013, Berlin

*Multiple scales in thin liquid films*, Summer School SPP 1506, 16.-17. July 2013, Aachen.

*On effective slip for an upper convected Maxwell fluid*, invited Talk and Visiting Fellow of the Isaac Newton Institute, Mathematical Modelling and Analysis of Complex Fluids and Active Media in Evolving Domains, 1. May - 23. Sept. 2013.

# Publications

BARBARA WAGNER

*submitted*

69. Kitavtsev, G., Münch, A., Wagner, B., ‘Thin film models for an active gel’, WIAS preprint 2451, submitted
68. Bommer, S., Seemann, R., Jachalski, S., Peschka, D. and & Wagner, B., ‘Liquid-liquid dewetting: Morphologies and rates’, WIAS preprint 2346, submitted
67. Jachalski, S., Münch, A. & Wagner, B., ‘Thin-Film Models for Viscoelastic Liquid Bi-Layers’, WIAS preprint 2187, submitted
66. Ahnert, T., Münch, A. & Wagner, B., ‘Models for the Two-Phase Flow of Concentrated Suspensions’, WIAS preprint 2047, submitted

*in peer-reviewed Journals*

65. Ahnert, T., Münch, A., Niethammer, B. & Wagner, B., *Stability of Concentrated Suspensions under Couette and Poiseuille Flow*, J. Eng. Math., <https://doi.org/10.1007/s10665-018-9954-x>, 2018
64. Meca, E., Münch, A. & Wagner, B., ‘Localized Instabilities and Spindodal Decomposition in Driven Systems in the Presence of Elasticity’, Phys. Rev. E, 97, 012801, 2018
63. Bergmann, S., Barragan-Yani, D. A., Flegel, E., Albe, K., Wagner, B., ‘Anisotropic solid-liquid interface kinetics in silicon: An atomistically informed phase-field model’, Modelling and Simulation in Materials Science and Engineering, Vol. 25(6), 2017
62. Bommer, S., Seemann, R., Jachalski, S., Peschka, D. and & Wagner, B., ‘Structure formation in thin liquid-liquid films’, Transport Processes at Fluidic Interfaces, D. Bothe, A. Reusken, eds., Advances in Mathematical Fluid Mechanics, Birkhuser, pp. 531–574, DOI 10.1007/978-3-319-56602-3, 2017
61. Dziwnik, M., Münch, A. & Wagner, B., 2017, ‘An Anisotropic Phase-Field Model for Solid-State Dewetting and its Sharp-Interface Limit’, *Nonlinearity*, Vol. 30(4), 1465, [doi.org/10.1088/1361-6544/aa5e5d](https://doi.org/10.1088/1361-6544/aa5e5d)

60. Meca, E., Münch, A. & Wagner, B., 2016, ‘Thin-Film Electrodes for High-Capacity Lithium-Ion Batteries: Influence of Phase Transformations on Stress’, *Proceedings of the Royal Society A*, Vol. 472, 2193, DOI: 10.1098/rspa.2016.0093
59. Korzec, M., Münch, A., Süli E. & Wagner, B., 2016, ‘Anisotropy in Wavelet Based Phase Field Models’, *Discrete Contin. Dyn. Syst. Ser. B* 21, 1167-1187.
58. Münch, A., Wagner, B., Cook, L. P., Braun, R.R., ‘Apparent Slip for an Upper Convected Maxwell fluid’, *SIAM J. Appl. Math.*, 77(2), 537564, 2017 (28 pages)
57. Meca, E., Münch, A. & Wagner, B., 2016, ‘Sharp-Interface Formation During Lithium Intercalation into Silicon’, *European Journal of Applied Mathematics*, accepted
56. Hennessy, M., Burlakov, V., Münch, A. , Goriely, A., Wagner, B., 2015, ‘ Controlled Topological Transitions in Thin Film Phase Separation’, *SIAM Journal for Applied Mathematics*, 75, 38-60.
55. Hennessy, M., Burlakov, V., Münch, A., Goriely, A. & Wagner, B., 2014, ‘ Propagating Topological Transformations in Thin Immiscible Bi-Layer Films’, *EPL*, 105, 66001.
54. Dziwnik, M., Münch, A. & Wagner, B., 2015, ‘Sharp-interface Limits of an Anisotropic Phase-Field Model for Solid-State Dewetting’, *IFAC-PapersOnLine*, Volume 48(1), 394-395.
53. Bäümchen, O., Marquant, L., Blossey, R., Münch, A., Wagner, B., & Jacobs, K., 2014, ‘Influence of Slip on the Rayleigh–Plateau Instability in Dewetting Viscous Films’, *Phys. Rev. Lett.*, 113, 014501.
52. Korzec, M., Roczen, M., Schade, M., Wagner B. & Rech, B., 2014, ‘Equilibrium Shapes of Poly-Crystalline Silicon Nanodots’, *J. Appl. Phys.*, 115, 074304.
51. Dziwnik, M. , Korzec, M., Münch, A., Wagner, B., 2014, ‘Stability Analysis of Unsteady, Nonuniform Base States in Thin Film Equations’, *SIAM J. Multiscale Model. Simul.*, 12(2), 755-780.
50. Jachalski, S., Peschka, D., Münch, A. & Wagner, B., 2014, ‘Impact of Interfacial Slip on the Stability of Liquid Two-Layer Polymer Films’, *J. Engrg. Math.*, 86(1), 9-29.
49. Jachalski, S., Huth R., Kitavtsev G., Peschka, D., Wagner, B., 2013, ‘Stationary Solutions of Liquid Two-Layer Thin-Film Models’, *SIAM J. Appl. Math.*, 73(3), 1183-1202.

48. Bommer, S., Jachalski, S., Peschka, D., Seemann, R. & Wagner, B., 2013, 'Droplets on Liquids and Their Long Way into Equilibrium', *The European Physical Journal E*, 36, 87.
47. Korzec, M., Münch, A. & Wagner, B., 2012, 'Anisotropic Surface Energy Formulations and their Effect on Stability of a Growing Thin Film', *IFB*, 14(4), 2012.
46. Kitavtsev, G., Recke, L. & Wagner B., 2012, 'Asymptotics for the Spectrum of the Linearized Thin Film Equation in a Singular Limit', *SIAM J. Appl. Dyn. Syst.*, 11(2), 1425-1457.
45. Schmidt, J., Prignitz, R., Peschka, D., Münch, A., Bänsch, E., Wagner, B. et al., 2012, '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*, 386(1), 240-251.
44. Münch, B., Please, C. & Wagner, B., 2011, 'Spin Coating of an Evaporating Polymer Solution', *Phys. Fluids*, 23, 102101.
43. Kitavtsev, G., Recke, L. & Wagner B., 2011, 'Centre Manifold Reduction Approach for the Lubrication Equation', *Nonlinearity*, 24(8), 2347-2369.
42. Grote, M., Palumberi, V., Barbero, A., Wagner, B. & Martin, I., 2011, 'Dynamic Formation of Oriented Patches in Chondrocyte Cell Cultures', *J. Math. Biol.*, 63(4), 757-777.
41. Münch, A. & Wagner, B., 2011, 'Impact of Slippage on the Morphology and Stability of a Dewetting Rim', *J. Phys.: Condens. Matter*, 23, 184101.
40. Kostourou, K., Peschka, D., Münch, A., Herminghaus, S., Seemann, R. & Wagner, B., 2010, 'Interface Morphologies in Liquid/Liquid Dewetting', *Chemical Engineering and Processing*, 63, 177-195.
39. Kitavtsev, & Wagner B., 2010, 'Coarsening Dynamics of Slipping Droplets', *J. Engrg. Math.*, 66, 271-292.
38. King, J.R., Münch, A. & Wagner, B., 2009, 'Linear Stability Analysis of a Sharp-Interface Model for Dewetting Thin Films', *J. Engrg. Math.*, 63, 177-195.
37. Bäumchen, O., Fetzer, R., Münch, A., Wagner, B. & Jacobs, K., 2009, 'Comprehensive Analysis of Dewetting Profiles to Quantify Hydrodynamic Slip', *UTAM*, 15, 51-65.

36. Rauscher, M., Blossey, R., Münch, A., & Wagner, B., 2008, ‘Spinodal Dewetting of Thin Films with Large Interfacial Slip: Implications from the Dispersion Relation’, *Langmuir*, 24(21), 12290-12294.
35. Korzec, M.D., P.L. Evans, P.L., Münch, A. & Wagner, B., 2008, ‘Stationary Solutions of Driven Fourth- and Sixth-Order Cahn-Hilliard Type Equations’, *SIAM Journal of Applied Mathematics*, 69, 348-374.
34. Münch, A. & Wagner, B., 2008, ‘Galerkin Method for Feedback Controlled Rayleigh-Bénard Convection’, *Nonlinearity*, 21(11), 2625-2651.
33. Afanasiev, K., Münch, A. & Wagner, B., 2008, ‘Thin Film Dynamics on Vertically Rotating Disk Partially Immersed in a Liquid Bath’, *Applied Mathematical Modelling*, 32(9), 1894-1922.
32. Fetzer, R., Münch, A., Rauscher, M., Jacobs, K. & Wagner, B., 2007, ‘Quantifying Hydrodynamic Slip: A Comprehensive Analysis of Dewetting Profiles’, *Langmuir*, 23(21), 10559-10566.
31. Afanasiev, K., Münch, A. & Wagner, B., 2007, ‘On the Landau-Levich Problem for Non-Newtonian Liquids’, *Physical Review E*, 76, 036307.
30. Rauscher, M., Münch, A., Wagner, B. & Blossey, R., 2006, ‘A Thin Film Model for Corotational Jeffreys Fluids under Strong Slip’, *Eur. Phys. J. E – Soft Matter*, 20, 365-368.
29. Rauscher, M., Münch, A., Wagner, B. & Blossey, R., 2006, ‘Slip vs. Viscoelasticity in Dewetting Thin Films’, *Eur. Phys. J. E – Soft Matter*, 20, 267-271.
28. Fetzer, R., Rauscher, M., Münch, A., Wagner, B. & Jacobs, K., 2006, ‘Slip-Controlled Thin Film Dynamics’, *Europhys. Lett.*, 75, 638-644.
27. King, J. R., Münch, A. & Wagner, B., 2006, ‘Linear Stability of a Ridge’, *Nonlinearity*, 19, 2813-2831.
26. Münch, A., Wagner, B. & Witelski, T.P., 2005, ‘Lubrication Models with Small to Large Slip Lengths’, *J. Engrg. Math.*, 53, 359-383.
25. Rauscher, M., Münch, A., Blossey, R. & Wagner, B., 2005, ‘A Thin-Film Equation for Viscoelastic Liquids of Jeffreys Type’, *Eur. Phys. J. E. Soft Matter*, 17, 373-379.
24. Fetzer, R., Jacobs, K., Münch, A., Witelski, T.P., & Wagner, B., 2005, ‘New Slip Regimes and the Shape of Dewetting Films’, *Phys.Rev. Lett.*, 95, 1278016.



23. Barbero, A., Palumberi, V., Sader, R., Grote, M.J., Wagner, B. & Martin, I., 2005, 'Experimental and Mathematical Study of the Influence of Growth Factor on the Growth Kinetics of Adult Human Articular Chondrocytes', *J. Cellular Physiol.* 204, 830–838.
22. Münch, A. & Wagner, B., 2005, 'Contact-Line Instability for Dewetting Thin Films', *Physica D.*, 209, 178-190.
21. Dreyer, W. & Wagner, B., 2005 'Sharp-Interface Model for Eutectic Alloys. Part I: Concentration Dependent Surface Tension', *IFB*, 7, 199–227.
20. Wagner, B., 2004, 'An Asymptotic Approach to Second-kind Similarity Solutions of the Modified Porous-Medium Equation', *J. Engrg. Math.*, 53, 201-220.
19. Wagner, B., Bertozzi, A.L. & Howle, L.E., 2003, 'Positive Feedback Control of Rayleigh-Bénard Convection', *Discrete and Continuous Dynamical Systems, Series B*, 3(4), 619-642.
18. Münch, A., Wagner, B. & Hoffmann, K.H., 1999, 'On the Generation and Spreading of Finger Instabilities in Film Coating Processes', *High Perform. Sci. Engin. Comp.*, Eds.: Bungartz, Durst, Zenger, Springer Verlag, 245-254.
17. Münch, A. & Wagner, B., 1999, 'Numerical and Asymptotic Results on the Linear Stability of a Thin Film Spreading Down a Slope of Small Inclination', *E.J.A.M.*, 10(3), 297-318.
16. Cole, J.D. & Wagner, B., 1996, 'On self-similar solutions of Barenblatt's nonlinear filtration equation', *E.J.A.M.*, 7, 151-167.  
(THIS ARTICLE HAS BEEN SELECTED BY E.J.A.M. AS ONE OF THEIR LEADING PAPERS OF THE DECADE, 1989-1999)
15. Tikhomirov, O., Cassis, B. & Wagner, B., 1993, 'Asymptotic Solution for Nonlinear Chemical Vapor Deposition Problems', *Quart. J. App. Math.*, 1993, 195, 585-597.
14. Kriegsmann, G.A., & Wagner, B., 1994, 'Microwave Heating of Carbon-Coated Ceramic Fibres', *Mat. Res.Soc. Symp. Proc.*, 347.
13. Kriegsmann, G.A., & Wagner, B., 1994, 'Microwave Heating of Carbon-Coated Ceramic Fibres: A Mathematical Model', *IMA Journal of Applied Mathematics*, 1995, 55, 243-255.
12. Levermore, C.D. & Wagner, B., 1993, 'Robust Fluid Dynamical Closures of the Broadwell Model', *Phys. Lett. A*, 174(3), 220-228.

11. Hagan, P.S., Cox, R. W. & Wagner, B., 1994, ‘Derivation of the High Field Semiconductor Equations’, *IMA*, 59, 159-184, Semiconductors Part II.
10. Wagner, B., ‘Generalization of Nonweiler Wings to Two-Dimensional Flow Fields Supporting Power Law and Exponential Shock Shapes’, Proc. of 1st International Hypersonic Waverider Symposium, University of Maryland, 1990.
9. Wagner, B., ‘Optimum Hypersonic Airfoil for Power Law Shock Waves’, *AIAA Journal*, 28(12), 2134.

*in Books/Collections*

8. Bommer, S., Jachalski, S., Peschka, D., Seemann, R., Wagner, B., 2017, ‘Structure Formation in Thin Liquid-Liquid Films’, *Transport Processes at Fluidic Interfaces*, Eds.: Bothe, D., Reusken, A., in *Advances in Mathematical Fluid Mechanics*, Springer/Birkhäuser.
7. Wagner, B., 2014, ‘The Mathematics of Nanostructuring Free Surfaces’, *MATHEON - Mathematics for Key Technologies*, Eds. M. Grötschel, D. Hömberg, J. Sprekels, V. Mehrmann, EMS Series in Industrial and Applied Mathematics.
6. Dreyer, W. & Wagner, B., 2014, ‘Mathematical Modeling of Multiscale Problems’, *MATHEON - Mathematics for Key Technologies*, Eds. M. Grötschel, D. Hömberg, J. Sprekels, V. Mehrmann, EMS Series in Industrial and Applied Mathematics.
5. Klein, R., Sanchez-Palencia, E., Sokolowski, J. & Wagner, B., 2006, ‘Applications of Asymptotic Analysis’, *Oberwolfach Reports, European Mathematical Society*, 3(2), 1663-1730.
4. Ahnert, T., Münch, A. & Wagner, B., 2013, ‘A Two-Phase Flow Model for Concentrated Suspensions’, [http://www.wias-berlin.de/preprint/1901/wias-preprints\\_1901.pdf](http://www.wias-berlin.de/preprint/1901/wias-preprints_1901.pdf).
3. Wagner, B., 1988, ‘Hypersonic Similarity Solutions for Airfoils Supporting Power Law Shock Waves’, *R.P.I. Math Report No.168*.

*Monographs*

2. Wagner, B., 1989, ‘Optimum Hypersonic Airfoils with Attached Shocks’, *Ph.D. Thesis*, Rensselaer Polytechnic Institute.

1. Wagner, B., 1999, 'Perturbation Techniques and Similarity Analysis for the Evolution of Interfaces in Diffusion and Surface Tension Driven Problems', *Habilitationschrift*, Zentrum Mathematik, Technische Universität München.