Alexander Schlaich

Curriculum Vitae

Research group leader
Insitute for Computational Physics
University of Stuttgart, Germany
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** 28 April 1986, Germany*

Vocational Experience

Research

since July 2020 **Research group leader**, *Multiscale Materials Modeling (M3)*, Insitutute for Computational Physics, University of Stuttgart, Germany, funded by CRC1313.

2017-2020 **Postdoctoral researcher**, *Laboratoire Interdisciplinaire de Physique*, Grenoble, France.

Multiscale modeling of adsorption, phase transitions and transport in porous media within the ANR project TAMTAM via molecular simulation and systematic upscaling using rigorous statistical mechanics approaches. Combined experimental/theoretical work on transport of water in soft confinement within the ANR project TWIST.

2012–2017 **Ph.D. student**, *Freie Universität Berlin*, Germany.

Thesis: Water effects on the interaction and friction between polar surfaces — Investigation of hydration, dielectric, electrostatic and frictional interactions between polar surfaces accross nano-confined water using theory and molecular simulation.

Sep. 2012 **Fellow of the HPC-Europa2 programme**, *Università degli Studi di Roma "La Sapienza"*, Rome, Italy.

Research stay with Sofia Kantorovich / group of Francesco Sciortino

2011–2012 **Research associate**, *Institute for Computational Physics, University of Stuttgart*, Stuttgart, Germany.

Development of a Poisson–Boltzmann solver for regions with dielectric mismatch and charge regulating surfaces and implementation of a Poisson–Nernst–Planck solver in the DUNE numerical environment. Involvement into the institutes teaching duties and contributions to the in-house molecular dynamics package ESPResSo.

Teaching

2012–2017 **Co-supervision**, two M.Sc. and three B.Sc. students in physics.

2017 **Classical Electrodynamics**, *Lecturer: Stefanie Russ*, Freie Universität Berlin.

2012–2016 **Computational Physics**, *Lecturer: Roland Netz*, Freie Universität Berlin.

Development of new teaching and exercise concept, based on Python and Jupyter. Replacement for presenting the lecture.

2011–2012 **Introduction to Computational Methods**, *Lecturer: Axel Arnold*, Universität Stuttgart.

2010–2012 **Simulation methods in physics**, *Lecturer: Christian Holm*, Universität Stuttgart.

2008–2010 **Physics Lab Course**, Universität Stuttgart.

Other

2006–2012 **System Administrator**, *Analytisches Insitut Bostel*, Stuttgart.
Administration and supervision of the IT infrastructure of the labratory concerned with chemical, microbiological and molecular biological foodstuffs analysis, consisting of about 40 workstations, 4 servers and 2 branch offices.

2010–2012 **Civil protection**, *Honorary post*.
Head of the German Red Cross community in Stuttgart-Feuerbach with about 120 active members. Platoon leader in the civil protection responsible for the emergeny patient treatment space.

2005–2012 **Ambulance Officer**, *DRK Rettungsdienst Stuttgart*.
Temporary/voluntary employment in the emergency medical services and ambulance service.

2002–2013 Active member of the German Red Cross, among others development of student emergency services at high schools and responsible for internal qualfication and education.

Education

2017 **Ph.D. thesis**, *Freie Universität Berlin*, Germany, Title: Water effects on the interaction and friction between polar surfaces.
Supervisor: Professor Dr. Roland Netz

2011 **Diploma thesis**, *University of Stuttgart*, Germany, Title: An iterative Poisson Boltzmann solver for regions with dielectric mismatch.
Supervisor: Professor Dr. Christian Holm

2005–2011 **Studies of Physics (Diploma degree)**, *University of Stuttgart*, Germany.

Publications

Publications in peer-reviewed journals

2020 P. Loche, C. Ayaz, A. Wolde-Kidan, A. Schlaich, and R. R. Netz. Universal and Nonuniversal Aspects of Electrostatics in Aqueous Nanoconfinement. *J. Phys. Chem. B*, 124(21):4365–4371, May 2020.

2019 A. Wolde-Kidan, Q. D. Pham, A. Schlaich, P. Loche, E. Sparr, R. R. Netz, and E. Schneck. Influence of polar co-solutes and salt on the hydration of lipid membranes. *Phys. Chem. Chem. Phys.*, 21(31):16989–17000, August 2019.

A. Schlaich, A. P. dos Santos, and R. R. Netz. Simulations of Nanoseparated Charged Surfaces Reveal Charge-Induced Water Reorientation and Nonadditivity of Hydration and Mean-Field Electrostatic Repulsion. *Langmuir*, 35(2):551–560, January 2019.

A. Schlaich and B. Coasne. Dispersion truncation affects the phase behavior of bulk and confined fluids: Coexistence, adsorption, and criticality. *J. Chem. Phys.*, 150(15):154104, April 2019.

P. Loche, A. Wolde-Kidan, A. Schlaich, D. J. Bonthuis, and R. R. Netz. Comment on 'Hydrophobic Surface Enhances Electrostatic Interaction in Water'. *Phys. Rev. Lett.*, 123(4):049601, July 2019.

P. Loche, C. Ayaz, A. Schlaich, Y. Uematsu, and R. R. Netz. Giant Axial Dielectric Response in Water-Filled Nanotubes and Effective Electrostatic Ion–Ion Interactions from a Tensorial Dielectric Model. *J. Phys. Chem. B*, 123(50):10850–10857, December 2019.

B. Kowalik, J. O. Daldrop, J. Kappler, J. C. F. Schulz, A. Schlaich, and R. R. Netz. Memory-kernel extraction for different molecular solutes in solvents of varying viscosity in confinement. *Phys. Rev. E*, 100(1):012126, July 2019.

2018 Q. D. Pham, A. Wolde-Kidan, A. Gupta, A. Schlaich, E. Schneck, R. R. Netz, and E. Sparr. Effects of Urea and TMAO on Lipid Self-Assembly under Osmotic Stress Conditions. *J. Phys. Chem. B*, 122(25):6471–6482, June 2018.

P. Loche, C. Ayaz, A. Schlaich, D. J. Bonthuis, and R. R. Netz. Breakdown of Linear Dielectric Theory for the Interaction between Hydrated Ions and Graphene. *J. Phys. Chem. Lett.*, 9(22):6463–6468, November 2018.

2017 A. Schlaich, J. Kappler, and R. R. Netz. Hydration Friction in Nanoconfinement: From Bulk via Interfacial to Dry Friction. *Nano Lett.*, 17(10):5969–5976, October 2017.

B. Kowalik, A. Schlaich, M. Kanduč, E. Schneck, and R. R. Netz. Hydration Repulsion Difference between Ordered and Disordered Membranes Due to Cancellation of Membrane–Membrane and Water-Mediated Interactions. *J. Phys. Chem. Lett.*, pages 2869–2874, June 2017.

M. Kanduč, A. Schlaich, A. H. de Vries, J. Jouhet, E. Maréchal, B. Demé, R. R. Netz, and E. Schneck. Tight cohesion between glycolipid membranes results from balanced water–headgroup interactions. *Nat. Commun.*, 8:14899, April 2017.

2016 A. Schlaich, E. W. Knapp, and R. R. Netz. Water Dielectric Effects in Planar Confinement. *Phys. Rev. Lett.*, 117(4):048001, July 2016.

M. Kanduč, A. Schlaich, E. Schneck, and R. R. Netz. Water-Mediated Interactions between Hydrophilic and Hydrophobic Surfaces. *Langmuir*, 32(35):8767–8782, September 2016.

2015 A. Schlaich, B. Kowalik, M. Kanduč, E. Schneck, and R. R. Netz. Physical mechanisms of the interaction between lipid membranes in the aqueous environment. *Physica A*, 418:105–125, January 2015.

2014 M. Kanduč, A. Schlaich, E. Schneck, and R. R. Netz. Hydration repulsion between membranes and polar surfaces: Simulation approaches versus continuum theories. *Adv. Colloid Interface Sci.*, 208:142–152, June 2014.

Submitted for review

2020 J. C. F. Schulz, A. Schlaich, M. Heyden, R. R. Netz, and J. Kappler. Molecular interpretation of the non-Newtonian viscoelastic behavior of liquid water at high frequencies. *arXiv:2003.08309 [cond-mat, physics:physics]*, 2020.

A. Schlaich, D. Jin, L. Bocquet, and B. Coasne. Wetting transition of ionic liquids at metal surfaces: A computational approach to electronic screening using a virtual Thomas-Fermi fluid. *arXiv:2002.11526 [cond-mat, physics:physics]*, 2020.

Book-chapters

2019 M. Kanduc, A. Schlaich, B. Kowalik, A. Wolde-Kidan, R. R. Netz, and E. Schneck. Simulation Approaches to Short-Range Interactions Between Lipid Membranes. In *Biomembrane Simulations: Computational Studies of Biological Membranes*. CRC Press, Portland, USA, April 2019.

2015 A. Schlaich, B. Kowalik, M. Kanduč, E. Schneck, and R. R. Netz. Simulation Techniques for Solvation-Induced Surface-Interactions at Prescribed Water Chemical Potential. In G. Sutmann, J. Grotendorst, G. Gompper, and D. Marx, editors, *Computational Trends in Solvation and Transport in Liquids*, volume 28 of *IAS Series*, pages 155–185. Forschungszentrum Jülich GmbH, Jülich, March 2015.

2012 Kanduč, Matej, A. Schlaich, E. Schneck, and R. R. Netz. Interactions between biological membranes: Theoretical concepts. In Lydéric Bocquet, David Quéré, Thomas A. Witten, and Leticia F. Cugliandolo, editors, *Soft Interfaces*, number 98 in Lecture Notes of the Les Houches Summer School. Oxford University Press, Oxford, July 2012.

Scientific communication

Invited international conference talks

Sep. 2017 **The transition from hydrodynamic via interfacial to dry friction for sheared surfaces in water**, *A. Schlaich, J. Kappler, and R. R. Netz*, BBSRC Workshop on nanofluidics in biological systems, Durham, Great Britain.

Oral presentation at international conferences

Mai 2019 **Coupling of Adsorption and Transport in Hierachical Porous Materials**, *A. Schlaich and B. Coasne*, Interpore 2019: Fluids in Nanoporous Media, Valencia, Spain.

Oct. 2018 **Modeling Adsorption and Transport in Multiscale Porous Media**, *A. Schlaich and B. Coasne*, Liquids@Interfaces, Bordeaux, France.

Mar. 2018 **Counterions in aqueous planar nano-confinement: Atomistic simulations and continuum modeling**, *A. Schlaich and R. R. Netz*, Annual Meeting of the German Physical Society, Berlin, Germany.

Mar. 2018 **From hydrodynamic via interfacial to dry friction for sheared surfaces in water**, *A. Schlaich, J. Kappler, and R. R. Netz*, Annual Meeting of the German Physical Society, Berlin, Germany.

Jul. 2016 **Water dielectric effects in planar confinement**, *A. Schlaich and R. R. Netz*, Protein Electrostatics 2016, Berlin, Germany.

Jun. 2016 **From wet to dry friction**, *A. Schlaich, J. Kappler, and R. R. Netz*, SOMATAI conference, Crete, Greece.

Mar. 2016 **The dielectric response of aqueous water slabs in nanoconfinement**, *A. Schlaich and R. R. Netz*, Annual Meeting of the German Physical Society, Regensburg, Germany.

Mar. 2015 **Hydration Interaction of Charged Polar Surfaces**, *A. Schlaich and R. R. Netz*, Minischool on Biophysics of Protein Interactions, ICTP SAIFR Sao Paolo, Brazil.

Oct. 2014 **Hydration Interaction of Polar Surfaces**, *A. Schlaich and R. R. Netz*, Exploring Solvation Science, 572. WE Haereus Seminar, Bad Honnef, Germany.

Mar. 2012 **A Poisson-Boltzmann solution of the two-colloids problem**, *A. Schlaich, S. Kesselheim, M. Sega, and C. Holm*, Annual Meeting of the German Physical Society, Berlin, Germany.

Invited seminar presentations and Colloquia

Sep 2019 **Water effects on the interaction and friction between polar surfaces**, *A. Schlaich*, Institute Charles Sadron.
Strasbourg, France

May 2019 **Coupling of Adsorption and Transport in Hierarchical Porous Materials**, *A. Schlaich and B. Coasne*, Joint Institute for Computational Physics and SFB 1313 Colloquium.
Stuttgart,Germnay

Oct. 2018 **The transition from hydrodynamic via interfacial to dry friction for sheared surfaces in water**, *A. Schlaich and R. R. Netz*, Institut de Chimie Séparative de Marcoule, France.

Jun. 2018 **Modeling Adsorption and Transport in Multiscale Porous Media**, *A. Schlaich*, Freie Universität Berlin, Germany.

Nov. 2015 **Interaction of [Charged] [Polar] [Soft] Surfaces**, *A. Schlaich*, Humboldt Universität Berlin, Germany.

Third party funded projects

2018-2020 **ANR/DFG**, *German/French research project*, (Coordinators J. Jouhet & E. Schneck).
Betaine Lipide in euKaryoten (BLinK)

2018-2019 **EUROKIN**, *Research contract*, (Coordinator B. Coasne).
Understanding Material Transport in Catalysts through Molecular Simulation