CURRICULUM VITAE

JOOST DE GRAAF

MIDDELBURG: JUNE 2, 1985

CURRENT WORK ADDRESS

Institute for Theoretical Physics
Department of Physics
Faculty of Science
Utrecht University

BUILDING : Buys Ballot Building 7.75
STREET : Princetonplein 5
CITY : 3584 CC Utrecht
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RESEARCH POSITIONS

presently **Assocciate Professor (UHD2)**
Theory and Simulation of Soft Matter, Hydrodynamics, and Biophysics
Utrecht University, Institute for Theoretical Physics, The Netherlands

2021 - 23 **Assistant Professor (UD1)**
Theory and Simulation of Soft Matter, Hydrodynamics, and Biophysics
Utrecht University, Institute for Theoretical Physics, The Netherlands

2018 - 21 **Tenure-Track Assistant Professor (UD2)**
Theory and Simulation of Soft Matter, Hydrodynamics, and Biophysics
Utrecht University, Institute for Theoretical Physics, The Netherlands

2015 - 17 **Marie Skłodowska-Curie Fellow**
University of Edinburgh, Institute for Condensed Matter and Complex Systems, Scotland

2015 - 15 **Group Leader**
Active Matter and Anisotropic Colloids
University of Stuttgart, Institute for Computational Physics, Germany

2012 - 14 **Rubicon Postdoctoral research associate** mentored by Prof. C. Holm
University of Stuttgart, Institute for Computational Physics, Germany

2008 - 12 **PhD Student** supervised by Prof. M. Dijkstra
Utrecht University, Debye Institute for Nanomaterials Science, Netherlands

SCHOLARSHIPS AND GRANTS

2024 - 29 ITN *Biomac-BP* (15 PI consortium; association status[1]), co-supervision of one PhD, KU Leuven, Belgium

2024 - 29 ITN *CoCoGel* (16 PI consortium; co-applicant), 4 year funding for a PhD, Utrecht University, Netherlands

2021 - 24 NWO Klein (presently M1) Grant (single PI), 4 year funding for a PhD, Utrecht University, Netherlands

2019 - 24 NWO Start-Up Grant (single PI), 5 year funding for one PhD and a 2-year postdoc, Utrecht University, Netherlands

2019 - 19 Infrastructure Fund AI4UU (610k€; co-applicant) to implement GPU-based artificial intelligence in Utrecht University's IT infrastructure, Utrecht University, Netherlands

2017 - 20	DFG SPP1726 Grant (author/unnamed co-PI[2]), 3 year funding for a PhD, University of Stuttgart, Germany
2015 - 17	Marie Skłodowska-Curie Personal Fellowship (personal), 2 years, University of Edinburgh, Scotland
2014 - 17	DFG SPP1726 Grant (author/named co-PI), 3 year funding for a PhD, University of Stuttgart, Germany
2013 - 15	NWO Rubicon Postdoctoral Scholarship (personal), 2 years, University of Stuttgart, Germany

Degrees and Qualifications

2023	**SKO** (Senior Teaching Qualification), Utrecht University, Netherlands
2021	**BKO** (Basic Teaching Qualification), Utrecht University, Netherlands
2012	**Ph.D** in Physics **cum laude**, Utrecht University, Netherlands **Supervisor:** Prof. M. Dijkstra & René van Roij **Thesis:** *Anisotropic Nanocolloids:* *Self-Assembly, Interfacial Adsorption, and Electrostatic Screening*
2008	**M.Sc.** in Physics **cum laude**, Utrecht University, Netherlands
2006	**B.Sc.** in Physics **and** Mathematics **cum laude**, Utrecht University, Netherlands

Academic Impact

04.03.2024	Google Scholar	Web of Science
Number of citations	3,289	2,344
h-index (all)	31	25

Academic Interests

My background is in the Statistical Mechanics of Soft-Matter systems. I am an expert in simulations involving hydrodynamic transport. My current research focuses on hydrodynamic interactions in passive and active systems, phoresis and osmosis mediated through (ionic) solute fields, viscoelastic fluids, complex out-of-equilibrium phenomena in dense fluids. Topics of interest include: colloidal gels, colloidal glasses, bacterial colonies, self-propelled particles, tesselation and geometry, jamming, tissue development, pattern formation due to chemical reactions.

Academic Specialities

Lattice-Boltzmann, Stokesian Dynamics, Monte Carlo, Molecular Dynamics, Crystal-Structure Prediction, Ewald Sums, Finite Element Methods, Analytic Electrokinetics, Classical Density Functional Theory, Free-Energy Calculations, Interfacial Adsorption, C++ and C Programming, CUDA Programming, WaLBerla, PyStencils, LBmPy, COMSOL, Mathematica, Linux, and Latex.

Other Professional Activities

- Coordinator of the Master's program Theoretical Physics (2018 onward; presently focusing only on the double-degree students), Coordinator of the double degree Bachelor's thesis projects (2019-2025), Data management and Impact officer of the Institute for Theoretical Physics (2019 onward), PhD Counselor for the Physics Department (2022 onward), Co-Organizer of the Departmental Open Day (2022 onward), contact for the Institute for Theoretical Physics within the

[1] Active role in grant writing. Utrecht University financial considerations prevented me from assuming a partner status.
[2] Wrote most of the grant proposal. Working in the UK at the time barred me from being a named co-applicant.

Impact Group of the Science Faculty, and sub-editor for the newsletter FYLAKRA (2018-2022); presently contributor to one column.

- I am a reviewer for Science Advances, Reviews of Modern Physics, Physical Review Letters, Journal of Rheology, Soft Matter, Physical Review E, The Journal of Chemical Physics, The European Physics Journal E, *etc*. I also review ERC (Starting Grants), NWO (Projectruimte), DFG individual grants, and PhD theses.
- Outreach via *Pint of Science* (2020); via the Utrecht University initiative the Rector's League (2021 & 2019); via a talk at the Utrecht Physics Society (2019); at the Weekend van de Wetenschap (2018 & 2019), funded by the Utrecht University *Public Engagemement Seed Fund* program; and at the National Museum for Edinburgh Science Festival (2016), *Demonstration with Mechanical Swimmer Models*. Lecturer of Statistical Physics at the National Physics Olympiad prep. classes (2020, 2021, 2022, and 2024). I also prepared problems for the 2023 "Project Interuniversitaire Olympiade Natuurkunde."

LANGUAGES

Dutch (native, C2)
English (fluent, C2)
German (proficient, B1)
French (basic, A2)
Spanish (basic, early B1)

HOBBIES

Baking and cooking, cinema with an emphasis on 80s films, and cycling.

ORGANIZING WORKSHOPS/SCHOOLS, INVITED TALKS, AND INVITED LECTURES

16. Computational Advances in Active Matter, Leiden, Dec. 11 - Dec. 15, 2023
    Organized together with Prof. Drs. T.N. Shendruk, S. Henkes, and J. Stenhammar
15. European Colloid & Interface Society Conference, Chania, Sept. 04 - Sept. 09, 2022
    Talk: Understanding enhanced rotational dynamics of active probes in rod suspensions
14. Computational methods and tools for complex suspensions, Bilbao, May 23 - May 27, 2022
    Talk: Understanding enhanced rotational dynamics of active probes in rod suspensions
13. Interdisciplinary Challenges in Nonequilibrium Physics, online, Apr. 12 - Apr. 16, 2021
    Talk: Probing Glassy Colloidal Systems with Active Particles
12. ITN Numerical Methods of Active Matter, Lisbon, Portugal, Jan. 18 - Feb. 04, 2021
    Lecture: Advanced MD methods + wrote book chapter
11. 27th Dutch Soft Matter Meeting, Utrecht, Netherlands, November 05, 2019
    Organized together with L. Filion
10. Statistical Mechanics of Active Matter School, L'Aquila, Italy, June 12-14 , 2019
    Lecture: Recognizing the Role of the Boundary
9. CECAM/ESBA 2019 workshop, Laursanne, Switzerland, July 25-27, 2019
    Organized together with A. Morozov + a talk on gelation
8. Simulating Soft and Active Matter with ESPResSo, ESPResSo++, and VOTCA, Stuttgart, Germany, Oct. 08-12, 2018
    Lecture on active matter
7. 24th Dutch Soft Matter Meeting, Leiden, Netherlands, June 8, 2018
    Talk: The Impact of Hydrodynamics on Colloidal Gel Collapse
6. Simulating Soft and Active Matter with ESPResSo, ESPResSo++, and VOTCA, Stuttgart, Germany, Oct. 09-13, 2017
    Lecture on active matter
5. Microswimmers International Conference, Bonn, Germany, Oct. 04-07, 2016
    Talk: Lattice-Boltzmann Methods for Autophoretic Swimmers
4. Simulating Soft and Active Matter with ESPResSo, ESPResSo++, and VOTCA, Stuttgart, Germany, Oct. 05-09, 2015
    Co-organizer and provided a lecture on active matter simualtions

3. The Future of Multi-Scale Soft Matter Modelling, Leiden, Netherlands, Aug. 31 - Sept. 04, 2015
   Talk: Towards Simulating Collective Motion of Chemically Self-Propelled Colloids
2. Micro- and NanoMachines, Hannover, Germany, July 02-05, 2014
   Talk: Catalytically driven anisotropic self-propelled colloids
1. 11th Dutch Soft Matter Meeting, Eindhoven, Netherlands, Nov. 07, 2011
   Talk: Hierarchical Self-Assembly of Suspended Branched Colloidal Nanocrystals into Super-Lattice Structures

TEACHING

I was awarded Best Teacher of the Year for the Department of Physics, 2023-24.

- *Introduction to Simulation Techniques* (1-day PhD course), taught J. de Graaf, 2024, FORTH, Crete
- *Soft and Active Matter Theory* (1 quadmester M.Sc.-level course), taught by R. van Roij and J. de Graaf, 2024, Utrecht University, Netherlands
- *Advanced Statistical Mechanics* (1 semester B.Sc.-level course), taught by J. de Graaf, 2024, Utrecht University, Netherlands
- *Non-Equilibrium Physics* (1 quadmester M.Sc.-level course), taught by L. Fritz and J. de Graaf, 2024, Utrecht University, Netherlands
- *Soft and Active Matter Theory* (1 quadmester M.Sc.-level course), taught by R. van Roij and J. de Graaf, 2023, Utrecht University, Netherlands
- *Advanced Statistical Mechanics* (1 semester B.Sc.-level course), taught by J. de Graaf, 2023, Utrecht University, Netherlands
- *Soft Matter Theory* (1 semester M.S.-level course), taught by R. van Roij and J. de Graaf, 2022, Utrecht University, Netherlands
- *Advanced Statistical Mechanics* (1 semester B.Sc.-level course), taught by J. de Graaf, 2022, Utrecht University, Netherlands
- *Student Seminar Theoretical Physics* (1 semester M.Sc.-level course), coordinated by J. de Graaf and T. Hinderer, 2021, Utrecht University, Netherlands
- *Advanced Statistical Mechanics* (1 semester B.Sc.-level course), taught by J. de Graaf, 2021, Utrecht University, Netherlands
- *Student Seminar Theoretical Physics* (1 semester M.Sc.-level course), coordinated by J. de Graaf, 2020, Utrecht University, Netherlands
- *Advanced Statistical Mechanics* (1 semester B.Sc.-level course), taught by J. de Graaf, 2020, Utrecht University, Netherlands
- *Student Seminar Theoretical Physics* (1 semester M.Sc.-level course), coordinated by J. de Graaf, 2019, Utrecht University, Netherlands
- *Advanced Statistical Mechanics* (1 semester B.Sc.-level course), taught by L. Filion and J. de Graaf, 2019, Utrecht University, Netherlands
- *Advanced Topics in Theoretical Physics* (a 5 week module of a M.Sc.-level course on CFD), taught by J. de Graaf, 2019, Utrecht University, Netherlands
- *Advanced Simulation Methods* (1 semester course, comprised of four three-week modules), taught by C. Holm, J. de Graaf, J. Smiatek, and M. Fyta, 2015, University of Stuttgart, Germany
- *Hauptseminar Active Matter* (1 semester course; weekly lectures), organized by C. Holm, C. Bechinger, J. de Graaf, and J. Gomez-Solano, 2015, University of Stuttgart, Germany

ONGOING (CO-)SUPERVISION OF STUDENTS

Students/researchers for whom I am the principle supervisor are in bold face.

2025 - ∗∗ T. Leeflang, B.Sc. Student at Utrecht University, Netherlands
Co-supervised by C. Tax (University Medical Center Utrecht, UMCU)
Co-supervised by T. Nikolaeva (University Medical Center Utrecht, UMCU)
Project: *28T Diffusion MRI on organoids*

2025 - ∗∗ F. Govi, B.Sc. Student at Utrecht University, Netherlands
Co-supervised by W. Torre (Theoretical Physics, Utrecht University)
Project: *Effective Modelling of Living Matter*

2025 - ∗∗ J. Maas, M.Sc. Student at Utrecht University, Netherlands
Co-supervised by J. de Wit (Netherlands Organisation for Applied Scientific Research, TNO)
Co-supervised by W. van Rossum (Netherlands Organisation for Applied Scientific Research, TNO)
Project: *Separation of Objects by selecting Radar-Signal Waveforms*

2024 - ∗∗ W. Verkuil, M.Sc. Student at Utrecht University, Netherlands
Co-supervised by D. Panja (Computing Science, Utrecht University)
Project: *Optimizing an FFTW-Based low-Re hydrodynamics solver*

2025 - ∗∗ R. Khandoori, PhD Candidate at KU Leuven, Belgium
Co-supervised by W. Thielemans (KU Leuven: Kortrijk)
Project: *Bacteria in Pickering-Ramsden Emulsions, BIOMAC-BP MSCA Network*

2023 - ∗∗ **D. Aslanis**, PhD Candidate at Utrecht University, Netherlands
Co-supervised by R. Besseling (InProcess-LSP; CoCoGel MCSA Network)
Project: *Shear-Deformation in Colloidal Gels*

2023 - ∗∗ B. Verhoef, PhD Candidate at Utrecht University, Netherlands
Co-supervised by R. Hermsen (Theoretical Biology, Utrecht University)
Project: *Resistance in Spatially Structured Bacterial Colonies*

2023 - ∗∗ **H. Nemati**, PhD Candidate at Utrecht University, Netherlands
Project: *Living Tissues and their Dynamics*

2021 - ∗∗ **K.W. Torre**, PhD Candidate at Utrecht University, Netherlands
Project: *The Role of Friction in Colloidal Gel Stability*

Completed (Co-)Supervision of Students and Researchers

Students/researchers for whom I was the principle supervisor are in bold face.

2024 - 25 L. van de Pol, B.Sc. Student at Utrecht University, Netherlands
Co-supervised by M. Hermes (InProcess-LSP & Utrecht University)
Project: *Inverse problems in particle size analysis*

2024 - 25 M. Ferwerda, B.Sc. Student at Utrecht University, Netherlands
Co-supervised by C.W. Oosterlee (Mathematics, Utrecht University)
Co-supervised by D. Brunner (Skope, Zurich, Switzerland)
Project: *Optimizing aspects of MRI techniques*

2024 - 25 X. Tian, M.Sc. Student at Utrecht University, Netherlands
Co-supervised by R. Bastiaansen (IMAU, Utrecht University)
Co-supervised by T.N. Shendruk (University of Edinburgh)
Project: *Proliferating Patterns using Swift-Hohenberg*

2024 - 24 **N. Fredriksz**, B.Sc. Student at Utrecht University, Netherlands
Project: *Vibrating Cells: Numerically Investigating Cell Sorting*

2024 - 24 **C. Kestur**, B.Sc. Student at Utrecht University, Netherlands
Project: *Identifying Partial Differential Equations for Biophysical Systems using Data-Driven Techniques*

2024 - 24 L. Eij, B.Sc. Student at Utrecht University, Netherlands
Co-supervised by M. Haase (Chemistry, Utrecht University)
Co-supervised by J. Steenhof (Chemistry, Utrecht University)
Project: *Phase-Field Modelling of Arrested Spinodal Decomposition*

2023 - 24 C. Zhu, M.Sc. Student at Utrecht University, Netherlands
Co-supervised by D. Panja (Computing Science, Utrecht University)
Project: *Developing Fast FFT-Based Solvers for Computational Hydrodynamics with Viscoelastic Responses*

2023 - 24 P. Michels, M.Sc. Student at Utrecht University, Netherlands
Co-supervised by D. Panja (Computing Science, Utrecht University)
Project: *Enhancing a Time-Independent CFD Solver with Moving Boundaries and Solids*

2023 - 24 T. Womack, M.Sc. Student at Utrecht University, Netherlands
Co-supervised by T.N. Shendruk (University of Edinburgh)
Project: *Pattern Formation and Cellular Growth*

2023 - 24 M. van Schaik, M.Sc. Student at Utrecht University, Netherlands
Co-supervised by K.W. Torre (Institute for Theoretical Physics, Utrecht University)
Project: *The gravitational collapse of colloidal gels*

2023 - 24 **M. Toos**, PhD Guest Researcher
Project: *The Dynamics of Oscillating Tissues*

2023 - 24 I. Degroote, B.Sc. Student at Utrecht University, Netherlands
Co-supervised by J.E. Frank (Mathematical Science, Utrecht University)
Project: *Chirality in hydrodynamic sedimentation of slender particles*

2023 - 23 E. Sijl, B.Sc. Student at Utrecht University, Netherlands
Project: *Models of Ca^{2+} Spiking in Cilia: Toward Modeling Left-Right Differentiation*

2022 - 23 **B. Verhoef**, M.Sc. Student at Utrecht University, Netherlands
Project: *Effect of Confinement on Bacterial Colony Growth*

2022 - 23 V. van Zwieten, M.Sc. Student at Utrecht University, Netherlands
Co-supervised by D. Panja (Computing Science, Utrecht University)
Project: *Bringing GPU Parallelization and Complex Boundaries to a Computational Fluid Dynamics Solver*

2022 - 22 **K. Sjöstedt**, Complex-Systems Project Student at Utrecht University, Netherlands
Co-supervised by D. Panja (Computing Science, Utrecht University)
Project: *Morphology and Characterisation of Bacterial Colonies Confined to Petri Dishes*

2021 - 23 **J. Roberts**, PhD Project at Utrecht University, Netherlands
Co-supervised by F. Jafarpour (Institute for Theoretical Physics, Utrecht University)
Project: *Understanding Bacterial Colony Growth using Machine Learning*
Terminated PhD prematurely

2021 - 23 F. Gaeremynck, M.Sc. Student at Utrecht University, Netherlands
Co-supervised by D. Panja (Computing Science, Utrecht University)
Project: *Improved methods on GPU-based versatile and efficient hydrodynamics code for scientific applications*

2021 - 22 H. Leeuwis, M.Sc. Student at Utrecht University, Netherlands
Co-supervised by J. Roberts (Institute for Theoretical Physics, Utrecht University)
Co-supervised by D. Panja (Computing Science, Utrecht University)
Project: *Identifying PDEs in Interacting Particle Systems using Data-Driven Techniques*

2021 - 22 M. van Leeuwen, B.Sc. Student at Utrecht University, Netherlands
Co-supervised by J.E. Frank (Mathematical Science, Utrecht University)
Co-supervised by K.W. Torre (Institute for Theoretical Physics, Utrecht University)
Project: *Toward Understanding the Impact of the Meniscus on the Dynamics of a Colloidal Gel using Continuum Models*

2021 - 22 M. Brouwer, B.Sc. Student at Utrecht University, Netherlands
Co-supervised by C. Oosterlee (Mathematical Science, Utrecht University)
Co-supervised by B. Négyesi (Mathematical Science, Utrecht University)

Project: *Applying Physics-informed Neural Networks to Chaotic Nonlinear Systems of Ordinary Differential Equations*

2021 - 22 T. Schouten, B.Sc. Student at Utrecht University, Netherlands
Co-supervised by P. Salanevich (Mathematical Science, Utrecht University)
Co-supervised by D. Brunner (Skope, Zurich, Switzerland)
Project: *Optimizing aspects of MRI*

2020 - 21 J. Roberts, double-degree M.Sc. Student at Utrecht University, Netherlands
Co-supervised by D. Valesin (Mathematical Science, University of Groningen)
Corrected by W. Ruszel (Mathematical Science, Utrecht University)
Project: *Asymptotic Shape of a One-Dimensional Growth Process in a Dynamic Environment*

2020- 21 B. Stam, M.Sc. Student at Utrecht University, Netherlands
Co-supervised by D. Panja (Computing Science, Utrecht University)
Project: *A GPU-based versatile and efficient hydrodynamics code for scientific applications*

2019 - 24 **M. Bos**, PhD at Utrecht University, Netherlands
Project: *Turning through disorder: Models of bundled mucus strands and microswimmers*

2019 - 22 M. Palusa, PhD at the University of Edinburgh, Scotland
Promotor: A. Morozov (University of Edinburgh)
Project: *Dynamics of Chiral Particles in Viscous Fluids*

2019 - 20 R. Meijer, B.Sc. Student at Utrecht University, Netherlands
Co-supervised by: M. Ries (Biomedical Imaging, University Medical Center Utrecht)
Project: *A numerical study on the sub- and ultraharmonic response of an oscillating microbubble in a rigid tube*

2019 - 20 **R. Hardeman**, B.Sc. Student at Utrecht University, Netherlands
Project: *Modeling viscosity-dependent reversal of fluid transport driven by magnetic cilia*

2019 - 20 **T. ter Rele**, B.Sc. Student at Utrecht University, Netherlands
Co-supervised by M. Bos (Institute for Theoretical Physics, Utrecht University)
Project: *Modelling the Dynamics of Epithelial Tissue*

2019 - 20 **C. Wiggers**, B.Sc. Student at Utrecht University, Netherlands
Co-supervised by M. Bos (Institute for Theoretical Physics, Utrecht University)
Project: *Growth Process of Disk- and Rod- Shaped Bacterial Colonies in 2D*

2019 - 20 **B. van den Bosch**, B.Sc. Student at Utrecht University, Netherlands
Project: *Minimal model of a nodal cilium*

2019 - 20 **C. Perugachi Israëls**, B.Sc. Student at Utrecht University, Netherlands
Project: *Cilia-induced Flow in the Embryonic Node of Mice and Asymmetric Gene Expression*

2019 - 20 **C. Abaurrea Velasco**, Postdoc at Utrecht University, Netherlands
Project: *Self-propelled Particles in Viscoelastic Media*

2018 - 19 **M. Inês Cravo**, M.Sc. Student at Utrecht University, Netherlands
Project: *Cellular Oscillations in Models of Biological Tissues*

2018 - 18 C. Stewart, M.Sc. Student at the University of Stuttgart, Germany
Supervised by M. Kuron (Institute for Computational Physics, University of Stuttgart)
Co-Supervised by C. Holm (Institute for Computational Physics, University of Stuttgart)
Project: *Simulating Viscoelastic Media using Lattice-Boltzmann*

2018 - 18 P. Stärk, B.Sc. Student at the University of Stuttgart, Germany
Supervised by M. Kuron (Institute for Computational Physics, University of Stuttgart)
Co-Supervised by C. Holm (Institute for Computational Physics, University of Stuttgart)

Project: *Toward Swimming in Porous Networks: Interactions Between Microswimmers and Obstacles*

2017 - 22 T. Welling, PhD at Utrecht University, Netherlands
Promotor: A. van Blaaderen (Debye Institute, Utrecht University)
Co-supervised by M. van Huis (Debye Institute, Utrecht University)
Project: *Rattle-type particles: Tuning colloidal interactions and electrokinetics for switchable colloidal crystals*

2017 - 17 **M. Haughey**, Senior Honours Student at the University of Edinburgh, Scotland
Project: *Simulating Hydrodynamic Flow during the Collapse of Colloidal Gels*

2016 - 21 **M. Kuron**, PhD (Magna cum Laude) at the University of Stuttgart, Germany
Promotor: C. Holm (Institute for Computational Physics, University of Stuttgart)
Project: *Lattice-Boltzmann Methods for Microswimmers in Complex Environments*

2016 - 17 **H. Menke**, Student Assistant at the University of Stuttgart, Germany
Project: *Discrete Self-Electrophoretic Self-Propelled Nanoparticles*

2016 - 16 R. Pruciak, Senior Honours Student shared with University of Edinburgh, Scotland
Co-supervised by A. Brown (Deptartment of Physics, University of Edinburgh)
Project: *The Fluid Dynamics of Sedimenting Helices (Experimental)*

2016 - 16 B. Droste, M.Sc. Student at the University of Utrecht, Netherlands
Supervised by M. Dijkstra (Debye Institute, Utrecht University)
Project: *Sedimentation of One and Two Helices including Hydrodynamic Interactions*

2015 - 16 **P. Kreissl**, M.Sc. Student at the University of Stuttgart, Germany
Project: *Autophoretic Mechanisms: Efficiency, Interactions, and Geometry*

2015 - 15 S. Ehrhardt, M.Sc. Student at the University of Stuttgart, Germany
Co-supervisor: G. Rempfer (Institute for Computational Physics, University of Stuttgart)
Project: *Simulation of Electroosmotic Flow through Nanocapillaries using Finite-Element Methods*

2015 - 15 **M. Kuron**, M.Sc. Student at the University of Stuttgart, Germany
Co-supervisor: G. Rempfer (Institute for Computational Physics, University of Stuttgart)
Project: *Efficient Lattice-Boltzmann Algorithms for Colloids Undergoing Electrophoresis*

2015 - 15 **S. Ilse**, B.Sc. Student at the University of Stuttgart, Germany
Project: *Motility Induced Phase Separation of Active Triangles with Surface Roughness*

2015 - 15 **F. Schultz**, B.Sc. Student at the University of Stuttgart, Germany
Project: *The Liquid-Crystal Phase Coexistence in Systems Doped with Active Particles*

2015 - 15 **M. Fabritius**, Project Student at the University of Stuttgart, Germany
Project: *Self-Propelled Particles near Flat and Curved Boundaries*

2014 - 16 G. Rempfer, PhD at the University of Stuttgart, Germany
Promotor: C. Holm (Institute for Computational Physics, University of Stuttgart)
Project: *Simulating Nanopores using Lattice-Based Electrokinetic Algorithms*

2014 - 14 **L. Fischer**, B.Sc. Student at the University of Stuttgart, Germany
Project: *Brownian Translation and Rotational Diffusion of anisotropic Colloids in cubic crystals: A Lattice-Boltzmann study of the Hydrodynamic Coupling with application to Rotator Phases*

2014 - 14 **T. Peter**, B.Sc. Student at the University of Stuttgart, Germany
Project: *Brownian Translational and Rotational Diffusion of a Spherical Colloid in Quasi-Two-Dimensional Confinement: A Lattice-Boltzmann Study of the Properties of the Raspberry Model*

2011 - 11 **E. Hildebrandt**, M.Sc. Student at Utrecht University, Netherlands
Co-supervised by M. Dijkstra (Debye Institute, Utrecht University)
Co-supervised by R. Bisseling (Mathematical Science, Utrecht University)

Project: *Towards Simulation Studies of Crystal Structures for Superellipsoids by Floppy Box Monte Carlo Method*

Summarizing, I have presently (co-)supervised 1 Postdoc; 12 PhD Candidates, of which 5 are still working toward their thesis — 1 was a guest researcher and 1 terminated their program prematurely; 20 M.Sc.-level students — 1 was a guest, of which 2 are working on their project; 25 B.Sc.-level students, of which 2 are working on their project (2 were senior honors students); and one student assistant (HiWi, Stuttgart).

Peer-Reviewed Papers

Please note that all paper titles below are hyperlinked to the relevant journal page.

62. B. Verhoef, R. Hermsen, and J. de Graaf, *Fluid-derived lattices for unbiased modeling of bacterial colony growth*, **submitted** (2025)
61. J. Melio, S. Riedel, A. Azadbakht, S. Caipa Cure, T. Evers, M. Babaei, A. Mashaghi, J. de Graaf, and D. Kraft, *The motion of catalytically active colloids approaching a surface*, Soft Matter **accepted** (2025)
60. K. Torre and J. de Graaf, *Delayed gravitational collapse of attractive colloidal suspensions*, J. Fluid Mech. **1000**, A73 (2024)
59. H. Nemati and J. de Graaf, *The cellular Potts model on disordered lattices*, Soft Matter **20**, 8337 (2024)
58. M. Bos, A. Ermund, G. Hansson, and J. de Graaf, *Goblet cell interactions reorient bundled mucus strands for efficient airway clearance*, PNAS Nexus **2**, pgad388 (2023)
57. K. Torre and J. de Graaf, *Hydrodynamic Lubrication in Colloidal Gels*, Soft Matter **19**, 7388 (2023)
56. J. de Graaf, K. Torre, W. Poon, and M. Hermes, *Hydrodynamic stability criterion for colloidal gelation under gravity*, Phys. Rev. E **107**, 034608 (2023)
55. K. Torre and J. de Graaf, *Structuring Colloidal Gels via Micro-Bubble Oscillations*, Soft Matter **19**, 2771 (2023)
54. T. Welling, A. Grau-Carbonell, K. Watanabe, D. Nagao, J. de Graaf, M. van Huis, and A. van Blaaderen, *Frequency-controlled electrophoretic mobility of a particle within a porous, hollow shell*, J. Colloid Interface Sci. **627**, 761 (2022)
53. N. Narinder, M. Bos, C. Abaurrea-Velasco, J. de Graaf, and C. Bechinger, *Understanding enhanced rotational dynamics of active probes in rod suspensions*, Soft Matter **18**, 6246 (2022)
52. S. Ketzetzi, M. Rinaldin, P. Dröge, J. de Graaf, and D. Kraft, *Activity-induced microswimmer interactions and cooperation in one-dimensional environments*, Nat. Commun. **13**, 1772 (2022)
51. A. Demirörs, S. Aykut, S. Ganzeboom, Y. Meier, R. Hardeman, J. de Graaf, A. Mathijssen, E. Poloni, J. Carpenter, C. Ünlü, and D. Zenhäusern, *Amphibious Transport of Fluids and Solids by Soft Magnetic Carpets*, Sci. Adv. **8** 2102510 (2021)
50. T. Welling, K. Watanabe, A. Grau-Carbonell, J. de Graaf, D. Nagao, A. Imhof, M. van Huis, and A. van Blaaderen, *Tunability of interactions between the core and shell in rattle-type particles studied with liquid-cell electron microscopy*, ACS Nano **15**, 11137 (2021)
49. T. Huang, B. Ibarlucea, A. Caspari, A. Synytska, G. Cuniberti, J. de Graaf, and L. Baraban, *Impact of surface charge on the motion of light-activated Janus micromotors*, Euro. Phys. J. E **44**, 39 (2021)
48. M. Kuron, C. Stewart, J. de Graaf, C. Holm, *An extensible lattice Boltzmann method for viscoelastic flows: complex and moving boundaries in Oldroyd-B fluids*, Euro. Phys. J. E **44**, 1 (2021)
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6. K. Miszta, J. de Graaf, G. Bertoni, D. Dorfs, R. Brescia, S. Marras, L. Ceseracciu, R. Cingolani, R. van Roij, M. Dijkstra, and L. Manna, *Hierarchical Self-Assembly of Suspended Branched Colloidal Nanocrystals into Superlattice Structures*, Nat. Mater. **10**, 872 (2011)
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1. J. Zwanikken, J. de Graaf, M. Bier, and R. van Roij, *Stability of Additive-Free Water-in-Oil Emulsions*, J. Phys.: Condens. Matter **20**, 494238 (2008)

Scientific publication is unfortunately prone to errors. The responsible course of action is to report these and provide transparency, such that these do not affect other researchers. Here, I list those issues that I am aware of for the papers listed above.

In [W.H. Evers *et al.*, Nano Lett. **13**, 2317 (2012)] the proposed argument for the orientation of the nanocrystals is overly simplified, this model was subsequently improved upon in [G. Soligno, M. Dijkstra, and R. van Roij, Phys. Rev. Lett. **116**, 258001 (2016)].

Both papers on the raspberry-particle method for fluid coupling [J. de Graaf *et al.*, J. Chem. Phys. **143**, 084108 (2015) and L. Fischer *et al.*, J. Chem. Phys. **143**, 084107 (2015)] contain minor oversights that are corrected and identified in the latest *arXiv* versions of the manuscripts in bold face. The most significant of these is an incorrect ordering of table entries.

In [M. Kuron *et al.*, J. Chem. Phys. **150**, 144110 (2019)] we report lattice artefacts for a moving squimer. I suspect that the origin of these is a bug/inconsistency in the way boundary conditions are handled in the lattice-Boltzmann (LB) algorithm of **`WaLBerLa`**, rather than something intrinsically wrong with implementing squimers in LB. This is because both for the electrokinetic version [M. Kuron *et al.*, J. Chem. Phys. **145**, 214102 (2016)] and the viscoelastic version of the LB method [M. Kuron *et al.*, Euro. Phys. J. E **44**, 1 (2021)], we were unable to get self-propelled particles or squimers to work properly. In fact, for the latter, there was a clear artefact, which depended sensitively on the direction in which the squirmer traversed the simulation box. In addition, snow-man-like swimmers in a viscoelastic LB medium came to a halt, rather than that they continued to move with a constant velocity. That is, the behavior is indicative of a momentum leak. My current understanding is that there is a small bug in the working of the moving boundary conditions in **`WaLBerLa`**, which is obscured by putting an external force on the object. Whenever the forces on the fluid are self-generated, as is the case with squirmers, this effect is much more noticeable. Squirmer particles in LB likely do not require the diameters that we report in [M. Kuron *et al.*, J. Chem. Phys. **150**, 144110 (2019)].

Finally, for [C. Abaurrea-Velasco *et al.*, Phys. Rev. Lett. **125**, 258002 (2020)] there was an oversight in terms of the referencing, which has been corrected *via* an erratum. In addition, it is my current understanding that the model that we used does not have a glass transition in the sense of the experimental system by the Bechinger group. That is, we misidentified the jamming transition as a glass transition. Nonetheless, the major elements of the paper hold, as can be appreciated from the follow-up study [N. Narinder *et al.*, Soft Matter **18**, 6246 (2022)].

Other Publications

3. M. Kuron, P. Kreissl, and C. Holm*, *Toward Understanding of Self-Electrophoretic Propulsion under Realistic Conditions : From Bulk Reactions to Confinement Effects*, Acc. Chem. Res. **51**, 2998 (2018)
2. J. de Graaf and L. Manna†, *A Roadmap for the Assembly of Polyhedral Particles*, Science **337**, 417 (2012)
1. M. Dijkstra, J. de Graaf, D. Vanmaekelbergh, and R. van Roij, *Orde uit wanorde: Van plantensex via Einstein naar zelf-assemblage van nanodeeltjes*, Nederlands Tijdschrift voor Natuurkunde **78**(7), 258 (2012)]

*For the Accounts in Chemical Research, I wrote most of the SPP grant, I co-supervised the research, wrote the conspectus, and reviewed part of the writing before submission. Unfortunately, I was forced to pull my name off the article, due to the way in which the writing of this manuscript was managed. Upon submission of the paper, the research that A. Brown had initiated on ionic screening for microswimmers and with which I was involved for the numerical aspects [A. Brown *et al.*, Soft Matter **13**, 1200 (2017)], was significantly misrepresented. This issue could have been easily avoided if the principles and practices of good scientific conduct had been respected. I was forced to have the involved PhD candidates fix this post peer-review. Please do not blame them for the way this work came about.

†The Science publication is an editorial perspective on the work by the group of S. Glotzer. The vast majority of the writing was carried out by L. Manna.

Regular Talks & Posters

Talks at local events, such as invited seminars, colloquia, *etc.* are not listed here.

37. DUCOMS, Utrecht, Nov. 12, 2024
    Talk: *JAX-Based Fast Stokesian Dynamics*

36. Physics@Veldhoven, Veldhoven, Nov. 12, 2024
    Focus Session (co-chair/organizer V. Garbin):
    Reshaping Colloidal Gels to create Novel Sustainable Materials
35. XIXth International Congress on Rheology, Athens, July 29 - Aug. 04, 2023
    Talk: *Understanding enhanced rotational dynamics of active probes in rod suspensions*
34. SoftComp Annual Meeting, Ancona, May 23 - May 25, 2023
    Talk: *Understanding enhanced rotational dynamics of active probes in rod suspensions*
33. New Perspectives in Active Systems, Dresden, April 24 - April 28, 2023
    Poster: *Understanding enhanced rotational dynamics of active probes in rod suspensions*
32. 2022 IFPRI Annual General Meeting, Leuven, Belgium, June 15, 2022
    Poster: *Oscillating Micro-Bubbles in Colloidal Gels*
31. Iontronics, Utrecht, Netherlands, Oct. 11, 2019
    Poster: *Self-Thermoelectrophoresis at Low Salinity*
30. 5th International Soft Matter Conference, Edinburgh, Scotland, June 3-7, 2019
    Poster: *Flow-Induced Dynamic Stability of Colloidal Gelation under Gravity*
29. 40th IFPRI Meeting, Edinburgh, Scotland, June 18-22, 2018
    Poster: *The Stability of Colloidal Gels: meniscus effects, hydrodynamics and two-component systems*
28. Thermodynamics Conference, Edinburgh, Scotland, September 5-7, 2017
    Talk: *Fluid Flow speeds up the Gravitational Collapse of Colloidal Gels*
27. 10th Liquid Matter Conference, Ljubljana, Slovenia, July 17-21, 2017
    Talk: *Fluid Flow speeds up the Gravitational Collapse of Colloidal Gels*
26. 26th International Conference on Discrete Simulation of Fluid Dynamics, Erlangen, Germany, July 10-14, 2017
    Talk: *Fluid Flow speeds up the Gravitational Collapse of Colloidal Gels*
25. 39th IFPRI Meeting, Philadelphia, United States of America, June 18-22, 2017
    Poster: *Gravity and Hydrodynamics join forces to destroy Colloidal Gels*
24. Microswimmers, Self-Propelled Particles, and Active Matter, Lausanne, Switzerland, March 6-8, 2017
    Talk: *Lattice-Boltzmann Simulations of Chemical Swimmers with Bulk-Ionic Dissociation*
23. 4th International Soft Matter Conference, Grenoble, France, Sept. 12-16, 2016
    Poster: *Bulk Ionic Dissociation is Crucial for Understanding Chemically-Propelled Swimmers*
    Poster: *The Interplay of Geometry and Hydrodynamics: Understanding the Motion of Self-Propelled Particles and Tracers*
22. Micro- and Nanomachines, Hannover, Germany, June 29 - July 1, 2016
    Poster: *The Interplay of Geometry and Hydrodynamics: Understanding the Motion of Self-Propelled Particles and Tracers*
21. 24rd International Conference on Discrete Simulation of Fluid Dynamics, Edinburgh, Scotland, July 13-17, 2015
    Talk: *Lattice-Boltzmann Simulations of Self-Propelled Rods: Snaking through a Micro Channel*
20. Microswimmers: from bulk to interfaces, Bordeaux, France, Apr. 13-15, 2015
    Talk: *Lattice-Boltzmann Simulations of Self-Propelled Rods: Snaking through a Micro Channel*
19. 23rd International Conference on Discrete Simulation of Fluid Dynamics, Paris, France, July 28 - Aug. 01, 2014
    Talk: *Catalytically driven anisotropic self-propelled colloids*
18. 9th Liquid Matter Conference, Lisbon, Portugal, July 21-25, 2014
    Poster: *Catalytically Driven Anisotropic Self-Propelled Colloids: Janus Spheres and Conical Swimmers*
17. 3rd International Soft Matter Conference, Rome, Italy, Sept. 16-19, 2013
    Poster: *Crystal Structure Prediction Using The Floppy-Box Monte Carlo Algorithm*

16. SFB TR6 CODEF III, Bonn, Germany, Mar. 20-23, 2012
    Talk: *Crystal Structure Prediction and Self-Assembly of Nonconvex Branched Nanoparticles and Colloids*
15. 12th Dutch Soft Matter Meeting, Amsterdam, Netherlands, Apr. 27, 2012
    Soundbite: *Poisson-Boltzmann Theory and Monte Carlo Simulations for Charged Janus Dipoles*
14. Physics@FOM, Veldhoven, Netherlands, Jan. 17-18, 2012
    Talk: *Hierarchical Self-Assembly of Suspended Branched Colloidal Nanocrystals into Superlattice Structures*
13. 8th Liquid Matter Conference, Vienna, Austria, Sept. 06-10, 2011
    Poster: *Predicting Crystal Structures and Phase Behavior of Faceted Non-Convex Colloids and Nanoparticles*
    Poster: *Monte Carlo and Poisson Boltzmann Studies of Heterogeneously Charged Colloids in an Electrolyte*
    Poster: *The Dynamics of Adsorption for Anisotropic Colloids near Liquid-Liquid Interfaces*
12. 10th Dutch Soft Matter Meeting, Utrecht, Netherlands, May 23, 2011
    Soundbite: *The Assembly of Octapod Nanocrystals into Chains and 3D Superstructures*
11. SFB TR6 Young Researcher Workshop, Utrecht, Netherlands, Apr. 18-19, 2011
    Talk: *Triangular-Tessellation based Numerical Techniques and their Applications: Interfacial Adsorption and Crystal-Structure Prediction of Anisotropic Colloids*
10. Physics@FOM, Veldhoven, Netherlands, Jan. 18-19, 2011
    Talk: *Triangular-Tessellation based Numerical Techniques and their Applications: Interfacial Adsorption and Crystal-Structure Prediction of Anisotropic Colloids*
9. 9th Dutch Soft Matter Meeting, Leiden, Netherlands, Nov. 24, 2010
    Soundbite: *Triangular Tessellation: Crystal Structures of Anisotropic Particles*
8. NanoSeminar, Utrecht, Netherlands, Oct. 15, 2010
    Talk: *Triangular-Tessellation in Colloid Science: Interfacial Adsorption and Crystal-Structure Prediction of Anisotropic Colloids*
7. 2nd International Soft Matter Conference, Granada, Spain, Jul. 05-08, 2010
    Poster: *Towards the Dynamics of Colloid Adsorption to Liquid-Liquid Interfaces*
6. 8th Dutch Soft Matter Meeting, Wagening, Netherlands, Apr. 14, 2010
    Soundbite: *Towards Adsorption Dynamics of Colloids at the Liquid-Liquid Interface*
5. IOP Complex Fluid-Fluid Interfaces, London, England, Feb. 25, 2010
    Talk: *Towards Adsorption Dynamics of Colloids at the Liquid-Liquid Interface: an Application of the Triangular Tessellation Scheme*
4. NWO CW (Xth Dutch Polymer Days), Veldhoven, Netherlands, Feb. 15-16, 2010
    Poster: *Interfacial Adsorption Dynamics of Colloids: Application of the Triangular Tessellation Technique*
3. Physics@FOM, Veldhoven, Netherlands, Jan. 20-21, 2010
    Poster: *Interfacial Adsorption Dynamics of Colloids: Application of the Triangular Tessellation Technique*
2. SFB TR6 Young Researcher Workshop, Mainz, Germany, Nov. 26-27, 2009
    Talk: *The Adsorption Mechanism of Colloids near the Liquid-Liquid Interface: a Triangular Tessellation Scheme*
1. Physics@FOM, Veldhoven, Netherlands, Jan. 20-21, 2009
    Poster: *Near Oil-Water Interfaces: Towards Understanding Emulsion Stability*

Additional International Schools and Workshops Attended

2024 *SCM 25-year Anniversary Symposium*, Utrecht, Netherlands

2024 *Trends in Theory*, Wageningen, Netherlands

2024 *CoCoGel: Kickoff Meeting*, Delft, Netherlands

2022	*CECAM: New frontiers in liquid matter*, Paris, France
2022	*Physics of Life Summer School*, Edinburgh, Scotland
2022	*Trends in Theory*, Wageningen, Netherlands
2022	*CECAM: Recent advances on the glass problem*, online
2019	*SCM 20-year Anniversary Symposium*, Utrecht, Netherlands
2018	*Machine Learning and Reverse Engineering for Soft Materials (Lorentz Workshop)*, Leiden, Netherlands
2018	*Topology in Complex Fluids (Lorentz Workshop)*, Leiden, Netherlands
2017	*Bio-Informulation 2017*, Edinburgh, Scotland
2017	*Higgs/SUPA meeting on non-equilibrium collective dynamics*, Perth, Scotland
2016	*Physical Principles of Biological and Active Systems*, Edinburgh, Scotland
2015	*The Future of Multi-Scale Soft Matter Modelling (Lorentz Workshop)*, Leiden, Netherlands
2014	*Active Particles and Microswimmers (MPI)*, Kreuth, Germany
2013	*GPU Programming using CUDA (HLRS)*, Stuttgart, Germany
2012	*ESPResSo Summer School (ICP)*, Stuttgart, Germany
2010	*MolSim 2010 (UvA)*, Amsterdam, Netherlands
2009	*Computer Simulation Approaches to Study Self-Assembly: From Patchy Nano-Colloids to Virus Capsids (CECAM)*, Lausanne, Switzerland
2009	*Mainz Materials Simulations Days 2009 (MPI)*, Mainz, Germany

Teaching Assistantships

- *Summer School on Active and Flowing Soft Matter* (a 5-day PhD-level summer school), organized by A. Morozov and C. Hooley, 2017, CM-CDT Higgs school, University of St. Andrews, Scotland
- *Hauptseminar Theorie und Simulation der weichen Materie* (1 semester course; weekly lectures), taught by C. Holm, J. Smiatek, M. Krüger, and M. Bier, 2014, University of Stuttgart, Germany
- *Hauptseminar Theorie und Simulation der weichen Materie* (1 semester course; weekly lectures), taught by C. Holm, J. Smiatek, M. Krüger, and M. Bier, 2013, University of Stuttgart, Germany
- *Thermische Fysica I* (1 semester course; weekly lectures), taught by R. van Roij and M. Dijkstra, 2008/2009, 2009/2010, and 2010/2011, Utrecht University, Netherlands
- *Electromagnetisme* (1/2 semester course; weekly lectures), taught by A. Imhof and C. Klaassen, 2010, Utrecht University, Netherlands