

Curriculum Vitae

Dr. Felix Frey



Summary statement

I am a theoretical physicist by training and I work primarily in the area of biophysics and soft matter. Complementary to having been trained in continuum modeling, I am making a transition to particle-based mesoscale computer simulations in my current postdoc which allows me to bridge scales. In my work, I study self-assembly and remodeling processes at biomembranes to develop a system-level understanding of living systems.

Academic positions

- 2022 – present Independent NOMIS fellow at the Institute of Science and Technology Austria (ISTA), with Anđela Šarić and Martin Loose
- 2020 – 2022 Postdoc at the Department of Bionanoscience, Kavli Institute of Nanoscience, Delft University of Technology (TU Delft), in the group of Timon Idema
- 2019 – 2020 Postdoc at the Institute for Theoretical Physics, Heidelberg University, in the group of Ulrich Schwarz
- 2015 – 2019 PhD researcher at the Institute for Theoretical Physics, Heidelberg University, in the group of Ulrich Schwarz

Education

- 06/2019 PhD at the Institute for Theoretical Physics, Heidelberg University
Thesis title: *Physical models for uptake processes at the cell membrane* (summa cum laude)
Advisor: Ulrich Schwarz
- 07/2015 Master of Science in Physics at Heidelberg University
- 07/2012 Bachelor of Science in Physics at Heidelberg University
- 06/2009 Abitur (A-level) at the Ludwig-Uhland-Gymnasium in Kirchheim unter Teck

Fellowships and awards

- 2022 Independent NOMIS fellowship (fully funded independent 3-year Postdoc position, worth 242.000€)
- 2022 IST-BRIDGE fellowship (fully funded independent 2-year Postdoc position), funded from the European Union's Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant agreement No 101034413 (declined)
- 2021 Kavli Synergy Grant (worth 50.000€)
- 2020 Among the six best dissertations at the Heidelberger Wilhelm-und-Else Heraeus dissertation prize for physics and astronomy
- 2018 Travel grant for the Biophysical Society Annual Meeting in San Francisco funded through the Excellence Initiative at Heidelberg University
- 2015 Full 3-year PhD fellowship of the Heidelberg Graduate School for Physics (HGSFP)
- 2009 School award of the German Physical Society (DPG)

Talks and posters at international conferences and seminars

- 2023 [Invitation](#) for a [talk](#) at the symposium *Septins: biology meets physics* at TU Delft, Delft
- 2023 Selected abstract for a [poster](#) at the *ISMC 2023 | 7th International Soft Matter Conference*, Osaka
- 2023 [Invitation](#) for a [talk](#) at the *DGZ Focus Workshop: Workgroup Membrane Trafficking and Molecular Motors (online)*
- 2023 [Invitation](#) for a [talk](#) at the symposium *Theoretical Physics - Theory of Condensed Matter* at Johannes Gutenberg University Mainz, Mainz
- 2023 [Invitation](#) for a seminar [talk](#) at the *Max-Planck-Institute of Biophysics*, Frankfurt am Main
- 2023 Selected abstract for a [talk](#) at the *EMBO | EMBL Symposium Life at the periphery: mechanobiology of the cell surface*, Heidelberg
- 2023 Selected abstract for a [talk](#) at the *DPG Spring Meeting*, Dresden
- 2022 [Poster](#) at *The Vienna Soft Matter Day*, IST Austria, Klosterneuburg
- 2022 [Talk](#) at *Soft Hour seminar series*, IST Austria, Klosterneuburg
- 2022 Selected abstract for a [talk](#) at the *DPG Spring Meeting*, Regensburg
- 2022 Contributed [flash talk](#) at *Dutch Soft Matter Meeting*, Delft
- 2022 Selected abstract for a [talk](#) at *SynCell2022*, The Hague
- 2022 [Invitation](#) for a [talk](#) at the *Statistical Physics and low dimensional systems conference*, Pont-à-Mousson
- 2022 Selected abstract for a [poster](#) at the *Biophysical Society Annual Meeting*, San Francisco
- 2022 [Talk](#) at the *BN Forum*, seminar of the Department of Bionanoscience, TU Delft (online)
- 2022 Selected abstract for a [poster](#) at *NWO Physics@Veldhoven* (online)
- 2021 Selected abstracts for a [talk](#) and a [poster](#) at *Dutch Biophysics* (online)
- 2021 Selected abstract for a [poster](#) at *EMBO Workshop Molecular and Cell Biology of Septins*, Berlin
- 2021 Selected abstract for a [poster](#) at *EMBO Workshop Physics of living systems: From molecules to tissues* (online)
- 2021 Selected abstract for a [poster](#) at the *BaSyC (Building a Synthetic Cell) Spring Meeting* (online)
- 2021 Selected abstract for a [poster](#) at the *DPG Spring Meeting* (online)
- 2019 Selected abstracts for [two talks](#) at the *DPG Spring Meeting*, Regensburg
- 2018 Selected abstract for a [poster](#) at the *Venice Meeting on Fluctuations in Small Complex Systems IV*, Venice
- 2018 [Talk](#) at *BioQuant Internal Seminar*, Heidelberg University
- 2018 Selected abstract for a [poster](#) and [flash talk](#) at the *BDBDB4 Meeting*, Heidelberg
- 2018 Selected abstract for a [talk](#) at the *DPG Spring Meeting*, Berlin
- 2018 Selected abstract for a [poster](#) at the *Biophysical Society Annual Meeting*, San Francisco
- 2017 Selected abstract for a [poster](#) at the *DPG Spring Meeting*, Dresden

Teaching experience and supervision

- 2019, winter [Exercises](#) in Electrodynamics (Bachelor course) at Heidelberg University
- 2019, summer [Lecture substitution](#) (one lecture) at Heidelberg University in Theoretical Biophysics (Master course) for Prof. Ulrich Schwarz
- 2016, winter [Exercises](#) in Stochastic Dynamics (Master course) at Heidelberg University
- 2016, winter [Exercises](#) in Non-linear Dynamics (Master course) at Heidelberg University
- 2016, summer [Exercises](#) in Theoretical Biophysics (Master course) at Heidelberg University
- 2015, winter [Exercises](#) in Theoretical Statistical Physics (Master course) at Heidelberg University

2022	<u>Co-supervision of two Bachelor End Projects at TU Delft</u>
2018	<u>Co-supervision of one Master thesis at Heidelberg University</u>
2016-2018	<u>Co-supervision of three Bachelor theses at Heidelberg University</u>

Reviewing activities

Physical Review Letters (APS), PRX Life (APS), Physical Review E (APS), The Journal of Applied Physics, The Journal of Chemical Physics, The Proceedings of the National Academy of Sciences (PNAS), eLife, Biology of the Cell, Nature Cell Biology

Administration and organization

2022	<u>Organization of the theory journal club</u> of the Department of Bionanoscience at TU Delft
2022	<u>Co-organization of the scientific retreat</u> for the theory division of the Department of Bionanoscience at TU Delft involving the groups of three principal investigators
2021	<u>Participation at the EMBO Lab Leadership course</u> for postdocs (online)

Publications

In preparation:

18. **F. Frey**, M. Amaral, A. Šarić, *Decoding membrane designs – curvature sorting reveals how membranes remodel, **in preparation*** (2024).
17. M. Amaral*, **F. Frey***, X. Jiang, B. Baum, A. Šarić, *Modeling the reshaping of archaeal bolalipid membranes, **in preparation*** (2024). *Equal contributions.
16. E. Berryman, E. Weiner, A. González Solís, **F. Frey**, A. Šarić and M. S. Otegui, *Membrane vesicle networks in plant endosomes, **in preparation*** (2024).
15. G. Castro Linares*, D. de Ridder*, **F. Frey***, T. Idema, and G. Koenderink, *Mutual control: how septin filament networks and membranes shape each other, **in preparation*** (2024). *Equal contributions.

Submitted and published:

14. **F. Frey**, U. S. Schwarz, *Coat stiffening explains the consensus pathway of clathrin-mediated endocytosis, **preprint available upon request, submitted*** (2023).
13. L. Baldauf, **F. Frey**, M. Arribas Perez, M. Vladenov, M. Way, T. Idema, G. Koenderink, *Biomimetic actin cortices shape cell-sized lipid vesicles, doi.org/10.1101/2023.01.15.524117, **preprint, in revision*** (2023).
12. L. Baldauf*, **F. Frey***, M. Arribas Perez, T. Idema, G. Koenderink, *Branched actin cortices reconstituted in vesicles sense membrane curvature, **Biophys. J.*** (2023). *Equal contributions.
11. M. Mund, A. Tschanz, Y.-L. Wu, **F. Frey**, J. L. Mehl, M. Kaksonen, O. Avinoam, U. S. Schwarz, and J. Ries, *Clathrin coats partially preassemble and subsequently bend during endocytosis, **J. Cell Biol.*** 222 (3): e202206038 (2023).
10. J. J. de Vries, D. M. Laan, **F. Frey**, G. H. Koenderink, M. P. M. de Maat, *A systematic review and comparison of automated tools for quantification of fibrous networks, **Acta Biomater.*** 157, 263-274 (2022).
9. **F. Frey**, and T. Idema, *Membrane area gain and loss during cytokinesis, **Phys. Rev. E*** 106, 024401 (2022).
8. **F. Frey**, and T. Idema, *More than just a barrier: using physical models to couple membrane shape to cell function, **Soft Matter**,* 17, 3533 – 3549 (2021).
7. **F. Frey**, and U. S. Schwarz, *Competing pathways for the invagination of clathrin-coated membranes, **Soft Matter*** 16, 10723-10733 (2020).
6. **F. Frey**, D. Bucher, K. A. Sochacki, J. W. Taraska, S. Boulant, and U. S. Schwarz, *Eden growth models for flat clathrin lattices with vacancies, **New J. of Phys.*** 22, 073043 (2020).

5. T. Wiegand, M. Fratini, **F. Frey**, K. Yserentant, Y. Liu, E. Weber, K. Galior, J. Ohmes, F. Braun, DP. Herten, S. Boulant, U. S. Schwarz, K. Salaita, E. A. Cavalcanti-Adam, and J. P. Spatz, *Forces during cellular uptake of viruses and nanoparticles at the ventral side*, **Nat. Commun.** 11, 32 (2020).
4. **F. Frey**, F. Ziebert, and U. S. Schwarz, *Dynamics of particle uptake at cell membranes*, **Phys. Rev. E** 100, 052403 (2019).
3. **F. Frey**, F. Ziebert, and U. S. Schwarz, *Stochastic dynamics of nanoparticle and virus uptake*, **Phys. Rev. Lett.** 122, 088102 (2019).
2. D. Bucher*, **F. Frey***, K. A. Sochacki, S. Kummer, JP. Bergeest, W. J. Godinez, HG. Kräusslich, K. Rohr, J. W. Taraska, U. S. Schwarz, and S. Boulant, *Clathrin-adaptor ratio and membrane tension regulate the flat-to-curved transition of the clathrin coat during endocytosis*, **Nat. Commun.** 9, 1109 (2018). *Equal contributions.
1. P. Kumberger, **F. Frey**, U. S. Schwarz, and F. Graw, *Multiscale modeling of virus replication and spread*, **FEBS Lett.** 590, 1972-1986 (2016).