

Sebastian Fürthauer

Curriculum Vitae

Born 29. Juli 1980, Vienna, Austria
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Career

Current Position, Assistant Professor, TU-Wien.

June 2016-February 2022, Flatiron Research Scientist in the Biophysical Modeling group of the Center for Computational Biology of the Flatiron Institute of the Simons Foundation, New York City, USA.

October 2013-June 2016, HFSP PostDoc with Michael Shelley at the Courant Institute for Mathematical Sciences of New York University (www.cims.nyu.edu), New York City, USA; and Daniel Needleman at FAS Center for Systems Biology (<http://sysbio.harvard.edu/csb/>), Harvard University, Cambridge, USA.

April 2013-October 2013, PostDoc with Sriram Ramaswamy at the TIFR Centre for Interdisciplinary Research (<http://www.tifrh.res.in>) in Hyderabad, India. This stay was funded by the DFG Fellowship (FU-961/1-1).

Juli 2012-April 2013, PostDoc with Frank Jülicher and Stephan Grill at Max Planck Institute for Physics of Complex Systems (<http://www.mpipks-dresden.mpg.de>) and Max Planck Institute of Molecular Cell Biology and Genetics (<http://www.mpi-cbg.de>) in Dresden .

Education

PhD Biologische Physik: April 2008 - June 2012

PhD Student with Frank Jülicher and Stephan Grill at Max Planck Institute for Physics of Complex Systems (<http://www.mpipks-dresden.mpg.de>) and Max Planck Institute of Molecular Cell Biology and Genetics (<http://www.mpi-cbg.de>) in Dresden. The title of my PhD thesis was Active Chiral Processes in Soft Biological Matter. I graduated with magna cum laude.

Diplom Ingenieur Technische Physik: May 2007

University studies in physics at Technische Universität Wien, Austria. Diploma thesis Quantum localization in the periodically kicked Rydberg atom: influence of noise. at the Institut für theoretische Physik der Technischen Universität Wien (<http://itp.tuwien.ac.at>) under the supervision of Univ. Prof. Dr. Joachim Burgdörfer.

Publications

P. J. Foster*, **S. Fürthauer***, N. Fakhri*, Active mechanics of sea star oocytes, <https://doi.org/10.1101/2022.04.22.489189>, *sub judice*
(*corresponding author)

B. Chakrabarti, M. J. Shelley, **S. Fürthauer***, Self-organized flows in phase-synchronizing active fluids, <https://arxiv.org/abs/2206.04035>, , Phys. Rev. Lett., *in press* (2023)
(*corresponding author)

Kanale, F. Ling, H. Guo, **S. Fürthauer**, E. Kanso, Spontaneous phase coordination and fluid pumping in model ciliary carpets, <https://doi.org/10.1073/pnas.2214413119> , Proceedings of the National Academy of Science **119** (45) e2214413119 (2022),

B. Chakrabarti, **S. Fürthauer***, M. J. Shelley*, A multiscale biophysical model gives quantized metachronal waves in a lattice of cilia, <https://doi.org/10.1073/pnas.2113539119>, Proceedings of the National Academy of Science **119** (4) e2113539119 (2022)
(*corresponding author)

S. Fürthauer*, M. J. Shelley*, How crosslink numbers shape the large-scale physics of cytoskeletal materials, <https://doi.org/10.1146/annurev-conmatphys-052521-093943>, The Annual Review of Condensed Matter Physics **13**:365-384 (2022)
(*corresponding author)

I. Lantzsch, C-H. Yu , H. Yazdkhasti, N. Lindow, E. Szentgyörgyi, S. Prohaska, M. Srayko, **S. Fürthauer*** and S. Redemann*, Changes in microtubule growth dynamics drive microtubule re-organization during female meiosis in *C. elegans*, <https://doi.org/10.7554/eLife.58903>, eLife 2021;10:e58903 (2021),
(*corresponding author)

N. T. Chartier*, A. Mukherjee*, J. Pfanzelter*, **S. Fürthauer**, B. T. Larson, M. Kreysing, F. Jülicher, S. W. Grill, A hydraulic instability drives the cell death decision in the nematode germline, <https://doi.org/10.1038/s41567-021-01235-x> , Nature Physics (2021),
(*equal contribution)

S. Fürthauer*, D. J. Needleman, M. J. Shelley, Design framework for actively crosslinked filament networks, <https://doi.org/10.1088/1367-2630/abd2e4>, New Journal of Physics **23** 013012 (2021),
(*corresponding author)

J. F. Pelletier, C. M. Field, **S. Fürthauer**, M. Sonnett, T. J. Mitchison, Co-movement of astral microtubules, organelles and F-actin suggests aster positioning by surface forces in frog eggs, <https://doi.org/10.1101/2020.06.17.154260>, eLife 2020;9:e60047 (2020)

S. Fürthauer*, B. Lemma, P. J. Foster, S. C. Emc-McClung, Che-Hang Yu, C. E. Walczak, Z. Dogic, D. J. Needleman, M. J. Shelley, Self-straining of actively crosslinked microtubule networks, Nature Physics **15** (12), 1295-1300 (2019)
(*first and corresponding author)

S. Redemann, **S. Fürthauer**, M. J. Shelley, T. Mueller-Reichert, Current approaches for the analysis of spindle organization, *Current Opinions in Structural Biology* **58**, pp269–277, (2019)
(*cover story*)

P. J. Foster, **S. Fürthauer**, M. J. Shelley, D. J. Needleman, From cytoskeletal assemblies to living materials, *Current Opinions in Cell Biology* **56**, pp109–114, (2019)

S. R. Naganathan, **S. Fürthauer**, J. Rodriguez, B. T. Fievet, F. Jülicher, J. Ahringer, C. V. Cannistraci and S. W. Grill, Morphogenetic degeneracies in the actomyosin cortex, *eLife* 2018;7:e37677, (2018)

B. Kaye, O. Stiehl, P. Foster, M. Shelley, D. Needleman, and **S. Fürthauer***, Measuring and modeling polymer gradients argues that spindle microtubules regulate their own nucleation, *New Journal of Physics*, **20**, 055012 (2018)
(* *corresponding author*)

P. Foster*, W. Yan*, **S. Fürthauer**, M. Shelley, D. Needleman, Connecting macroscopic dynamics with microscopic properties in active microtubule network contraction, *New Journal of Physics*, **19**, 125011 (2017)
(**equal contribution*)

S. Redemann, J. Baumgart, N. Lindow, M. Shelley, E. Nazockdast, A. Kratz, S. Prohaska, J. Brugues, **S. Fürthauer**, and T. Mueller-Reichert, C. elegans chromosomes connect to centrosomes by anchoring into the spindle network, *Nature Communications* **8**, 15288 (2017)

S. R. Naganathan*, T. Middelkoop*, **S. Fürthauer***, S. W. Grill, Actomyosin driven left-right asymmetry: from molecular torques to chiral self-organization, *Current Opinions in Cell Biology* **38**, pp24–30 (2016)
(**equal contribution*)

P. J. Foster, **S. Fürthauer**, M. J. Shelley, D. J. Needleman, Active Contraction of Microtubule Networks, *eLife* 2015;10.7554/eLife.10837 (2015)

S. R. Naganathan*, **S. Fürthauer***, M. Nishikawa, F. Jülicher, S. W. Grill, Active torque generation by the actomyosin cell cortex drives left–right symmetry breaking, *eLife* 2014;3:e04165 (2014)
(**equal contribution*)

S. Fürthauer and S. Ramaswamy, Phase-Synchronized State of Oriented Active Fluids, *Phys. Rev. Lett.* **111**, 238102 (2013)

S. Fürthauer*, M. Stempel*, S. W. Grill and F. Jülicher, Active chiral processes in thin films, *Phys. Rev. Lett.* **110**, 048103 (2013)
(**equal contribution*)

S. Fürthauer, M. Stempel, S. W. Grill and F. Jülicher, Active chiral fluids, *Eur. Phys. J. E* **35** 89 (2012)

S. Fürthauer, M. Neef, S. W. Grill, K. Kruse and F. Jülicher The Taylor-Couette motor: spontaneous flows of active polar fluids between two coaxial cylinders, *New J. Phys.* **14** 023001 (2012)

E. Persson, **S. Fürthauer**, S. Wimberger, and J. Burgdörfer, Transient localization in the kicked Rydberg atom, *Phys. Rev. A* **74** 053417 (2006)

Teaching:

2022/23/... Grundlagen der Physik 1a + 1b + 2a + 2b (VU), TU Wien
Physics of Living Matter (VO + PR), TU Wien
PhD Advisor for Cedrik Barutel, TU Wien

2021/22/23 Thesis Committee for John B. Linehan, Maddox Lab (UNC)

2021 Seminar class in the Emerging Fields in Architecture series, TU Wien

2019 Seminar class in the active fluids lecture series at NYU

2018/19 Supervision of Master Thesis on Instabilities in Contracting Active Materials by Shigeng Sun, NYU

2016/17/18 Teaching assistant Physiology course, MBL, Woods Hole

2014 Supervision of a summer project on contractions in active systems by William Thomas Lentz II, NYU
ASCB undergraduate poster competition judge

2010/11 Supervision of the diploma thesis on Thin Films of active chiral Fluids by Maria Stempel, TU Dresden

2009 Tutoring classes in biological physics, TU Dresden

2008 Tutoring mathematical methods classes, TU Dresden

2005 Tutoring classes in statistical physics, TU Wien

Fellowships and awards

2021 WWTF Vienna Research Group, Young Investigator Award (1.6 Million Euro).

2016 EPJ E Distinguished Referee

2014 ASCB Travel Award
HFSP Cross Disciplinary Fellowship

2013 DFG PostDoctoral Fellowship (FU-961/1-1)

Presentations at Conferences and Workshops

2022 Flatiron Mechanics of Life Meeting, New York, Talk
APS March Meeting, Chicago *virtual*, Poster + Talk

2021 HFSP Meeting, *virtual*, Poster
APS March Meeting, *virtual*, Talk

2020 KITP Program on Symmetry, Thermodynamics and Topology in Active Matter, Santa Barbara, Talk
Flatiron Workshop on Mitotic Spindles, New York, Talk

2019 ASCB Annual Meeting, Washington DC, Poster
GRC Soft Condensed Matter Physics, New London, Poster
Flatiron Workshop on Mitotic Spindles, New York, Talk
Mathematical Fluids, Materials and Biology, Ann Arbor, Talk
GRC Complex Active and Adaptive Materials, Ventura, Talk + Poster

2018 APS March Meeting, Boston, Talk
 Mitotic Spindle Meeting, Split, Talk
 ASCB Annual Meeting, San Diego, Poster
 APS DFD annual Meeting, Atlanta, Talk
 EFMC12, Vienna, Talk
 2017 APS March Meeting, Los Angeles, Talk
 SIAM CSE, Atlanta, Talk
 HFSP Awardees Meeting, Lissabon, Talk + Poster
 ASCB Annual Meeting, Philadelphia, Poster
 2016 Flatiron Workshop on Biological Active Matter, New York, Talk
 ASCB Symposium on Quantitative Biology of the Cell, New York, Talk
 APS DFD annual meeting, Portland, Talk
 2015 ASCB Annual Meeting, San Francisco, Poster
 KITP Program on Evolutionary Cell Biology, Santa Barbara, Talk
 HFSP Awardees Meeting, San Diego, Poster
 Kyoto Winter-school on the frontiers of statistical
 mechanics, Kyoto, Talk and Poster
 2014 ASCB annual meeting, Philadelphia, Poster
 Active Fluids: Bridging Complex and Biofluids, Aspen Center
 of for Physics, Poster
 2013 Perspectives on Nonlinear Dynamics, Hyderabad, Talk
 2012 Meeting in the honor of Jacques Prost, Les Houches, Poster
 Physic of the Cell, London, Poster
 Circle Meeting, Paris, Talk
 DPG spring meeting, Berlin, Poster
 2011 8th Liquid Matter Conference, Vienna, Poster
 Boulder Summer-school on Hydrodynamics, Talk and Poster
 Circle Meeting, Saarbrücken, Poster
 DPG spring meeting, Dresden, Poster
 2010 Circle Meeting, Amsterdam, Talk
 DPG spring meeting, Regensburg, Talk
 FEBS Advanced Lecture Course: cytoskeleton, contractility
 and motility Pierre-Gilles de Gennes Winter School,
 Cargese, Talk and Poster
 2009 Circle Meeting, Dresden, Poster
 DPG spring meeting, Dresden, Poster

Refereeing Services:

Phys. Rev. Lett., Nature Communications, Phys. Rev. E, Eur. Phys. J. E, Soft Matter,
 PNAS, Scientific Reports, Scientific Advances, PLOS Computational Biology, Molecular
 Biology of The Cell, Cells, Nature Physics, New Journal of Physics, Biophysical Journal,
 Journal of Physics Communications