

JAN STEINKÜHLER

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EDUCATION

- 2013 – 2016 Dr. rer. nat. (Ph.D. equivalent)
TU Berlin, Germany. Faculty II - Mathematics and Natural Sciences
summa cum laude (with distinction)
Oral exam 24th of April 2016.

Thesis title *Partitioning of membrane components in adhering vesicles*
- 2005 – 2011 Diplomingenieur (M.Sc. equivalent)
RWTH Aachen, Germany. Faculty of Electrical Engineering
Studies in electrical and medical engineering, physics and mathematics.
Study visit (12 months) to KTH Stockholm, Sweden 2009.

Thesis title *Development of a wireless dielectric sensor for bone growth and density*

RESEARCH AND PROFESSIONAL EXPERIENCE

- 2020 – Postdoc with Prof. Neha Kamat
Northwestern University, Evanston, USA
- 2016 – 2020 Postdoc with Prof. Reinhard Lipowsky
MaxSynBio - Max Planck Institute of Colloids and Interfaces, Potsdam, Germany
- Studies on shape control and shape instabilities of vesicles and membrane elasticity
- 2015 Research visit (6 month). Prof. Dennis Discher
University of Pennsylvania, Philadelphia, USA
- Signaling pathway CD47/ SIRP α exhibits binding cooperativity by suppression of membrane fluctuations
- 2013 – 2016 Doctorate research with Dr. Rumiana Dimova
Max Planck Institute of Colloids and Interfaces, Potsdam, Germany
- Studies on adhesion of model membranes and mechanical properties of plasma membrane vesicles
- 2011–2012 Scientific staff. Supervisor Prof. Peter Ertl
Austrian Institute of Technology, Vienna, Austria
- Development of a wireless impedance biosensor for tissue and cell density measurements

2009 Undergrad project. Supervisor Prof. Andreas Offenhäusser
IBN-2 Forschungszentrum Jülich, Germany
- Capacitive biosensor for measurements of neuron action potentials

2006 – 2007 ERICSSON Eurolab Aachen, Germany
- Deployment of a multimedia network for seamless content streaming

AWARDS

2019-2020 Google Cloud Platform research grant

2014 DAAD RISE Scholarship

2013 – 2016 Scholarship IRTG 1524 Self-Assembled Soft Matter Nano-Structures at Interfaces

TEACHING EXPERIENCE

2019 Supervision of PhD student Shreya Pramanik

2015 Supervision of undergrad student Philippe De Tillieux.
Resulted in co-author paper with the undergrad.

2007 Tutor for undergrad course in Electrostatics. Duties included preparation and presentation of calculation problems and correction of student exercises.

RELEVANT SKILLS

Programming, simulation and data analysis (MATLAB, C++, COMSOL, ImageJ), optical tweezers, advanced fluorescent microscopy including super resolution (FLIM, FCS, FRET, TIRF, STED), preparation and handling of lipid model membranes (LUVs, GUVs, SLBs and GPMVs), membrane protein reconstitution, colloidal characterization (DLS, Zetapotential, UV-VIS), design and operation of custom experimental setups including development of mechanical and electrical components, cell culture and imaging, design, fabrication and operation of microfluidic systems, fluent in English and German, basic knowledge of the Czech language

SERVICE TO THE COMMUNITY

Reviewer for: Biophysical Journal, Langmuir, ACS Nano, ACS Omega, Journal of Membrane Biology, Scientific Reports, Communications Biology

PUBLICATIONS

In reverse chronological order, top five publications marked *. Google scholar <https://goo.gl/EDBUaq>

1. Energy Dissipation at Interfaces Drives Multicompartment Remodeling
J. Steinkühler, N.P. Kamat
Chem (*in-press*)
2. The mechanical tension of biomembranes can be measured by super resolution (STED) microscopy of force-induced nanotubes
D. Roy, **J. Steinkühler**, Z. Zhao, R. Lipowsky, R. Dimova
Nano Letters (*in-press*)
3. Reversible pH responsive coacervate formation in lipid vesicles activates dormant enzymatic reactions
C. Love , **J. Steinkühler** , D. T. Gonzales , N. Yandrapalli , T. Robinson , R. Dimova , T.-Y. Dora Tang
Angew. Chem. Int. Ed., 2020, *in press*
4. **Superelasticity of the plasma membrane by coupling of membrane curvature and lipid liquid-liquid phase separation**
J. Steinkühler*, T. Bhatia, Z. Zhao, R. Lipowsky, R. Dimova* *co-corresponding authors
in preparation preprint can be send upon request
5. **Controlled division of cell-sized vesicles by low densities of membrane-bound proteins,**
J. Steinkühler, R. L. Knorr, Z. Zhao, T. Bhatia, S. M. Bartelt, S. Wegner, R. Dimova, and R. Lipowsky
Nature Communications, 11(1), 2020
6. Simple sugars shape giant vesicles into multispheres with many membrane necks
T. Bhatia , S. Christ , **J. Steinkühler** , R. Dimova and R. Lipowsky
Soft Matter, 2020, *in press*
7. Bending rigidity of charged lipid bilayer membranes
H. A. Faizi, S. L. Frey, **J. Steinkühler**, R. Dimova, P. M. Vlahovska
Soft Matter, 15, 6006-6013, 2019
8. Light controlled cell to cell adhesion and chemical communication in minimal synthetic cells
T. Chakraborty, S. M Bartelt, **J. Steinkühler**, R. Dimova, S. V. Wegner
Chemical Communications, 2, 2019
9. **Mechanical properties of plasma membrane vesicles correlate with lipid order and viscosity and depend on cell density**
J. Steinkühler*, E. Sezgin, I. Urbancic, C. Eggeling, R. Dimova* *co-corresponding authors
Communications Biology, 2, 2019
10. Spatial relationship and functional relevance of three lipid domain populations at the erythrocyte surface
L. Conrard, A. Stommen, A.-S. Cloos, **J. Steinkühler**, R. Dimova, H. Pollet, T. Donatienne
Cellular Physiology and Biochemistry, 51,1544-1565, 2018
11. Asymmetric ionic conditions generate large membrane curvatures
M. Karimi, **J. Steinkühler**, D. Roy, R. Dasgupta, R. Lipowsky and R. Dimova
Nano letters, 18(12), 7816-7821, 2018
12. **Light guided motility of a minimal synthetic cell**
S. M. Bartelt*, **J. Steinkühler***, R. Dimova, S. V. Wegner *equal contribution
Nano Letters, 18(11), 7268-7274, 2018
13. **Membrane fluctuations and acidosis regulate cooperative binding of "marker of self" CD47 with macrophage checkpoint receptor SIRP α**
J. Steinkühler, B. Rózycki, C. Alvey, R. Lipowsky, T.R. Weikl, R. Dimova, D. Discher
Featured first-author interview <http://jcs.biologists.org/content/132/4/jcs222141>
Journal of Cell Science, 132(4), 2018
14. Charged giant unilamellar vesicles prepared by electroformation exhibit nanotubes and transbilayer lipid asymmetry
J. Steinkühler, P. De Tillieux, R.L. Knorr, R. Lipowsky, R. Dimova
Scientific reports 8 (1), 11838, 2018
15. Micron-sized domains in quasi single-component giant vesicles
R.L. Knorr, **J. Steinkühler**, R Dimova
Biochimica et Biophysica Acta (BBA) – Biomembranes 1860 (10), 1957-1964, 2018
16. Dynamic blue light-switchable protein patterns on giant unilamellar vesicles,
S Mareike Bartelt, E. Chervyachkova, **J. Steinkühler**, J. Ricken, R. Wieneke, R. Tampé, R. Dimova, S. V. Wegner
Chemical Communications 54 (8), 948-951, 2018

17. Phase Behavior of Charged Vesicles Under Symmetric and Asymmetric Solution Conditions Monitored with Fluorescence Microscopy
B. Kubsch, T. Robinson, **J. Steinkühler**, R. Dimova
Journal of visualized experiments: JoVE, e56034 2017
18. Modulating Vesicle Adhesion by Electric Fields
J. Steinkühler, J. Agudo-Canalejo, R. Lipowsky, R. Dimova
Biophysical journal 111 (7), 1454-1464, 2016
19. Posing for a picture: vesicle immobilization in agarose gel,
R.B. Lira, **J. Steinkühler**, R.L. Knorr, R. Dimova, K.A. Riske
Scientific reports 6, 25254, 2016
20. From beetles in nature to the laboratory: actuating underwater locomotion on hydrophobic surfaces,
B.E. Pinchasik, **J. Steinkühler**, P. Wuytens, A.G. Skirtach, P. Fratzl, H. Möhwald
Langmuir 31 (51), 13734-13742, 2015
21. Zirconium dioxide nanolayer passivated impedimetric sensors for cell-based assays,
D. Sticker, M. Rothbauer, V. Charwat, **J. Steinkühler**, O. Bethge, P. Ertl
Sensors and Actuators B: Chemical 213, 35-44, 2015
22. Characterization of Double Layer Alterations Induced by Charged Particles and Protein–Membrane Interactions Using Contactless Impedance Spectroscopy,
J. Steinkühler, V. Charwat, L. Richter, P. Ertl
The Journal of Physical Chemistry B 116 (35), 10461-10469, 2012

BOOK CHAPTERS

1. Giant Vesicles: A Biomimetic Tool for Assessing Membrane Material Properties and Interactions,
J. Steinkühler and R. Dimova, Nieh, M. (Ed.), Heberle, F. (Ed.), Katsaras, J. (Ed.) (2019).
Characterization of Biological Membranes. Structure and Dynamics. Berlin, Boston: De Gruyter.

ORAL PRESENTATIONS

1. Seminar Talk SFB 803 2020, Göttingen, "Understanding and engineering biomembranes for synthetic biology"
2. Biomembrane days 2019, Berlin, "Controlled division of cell-sized vesicles by low densities of membrane-bound protein"
3. Public outreach lecture 2019, Schloss Schönow "Emergence of shape and patterns in biological systems"
4. Biophysical Society Meeting 2019, Baltimore "Budding and fission of vesicles by control of membrane spontaneous curvature"
5. Seminar Daniel Fletcher Lab 2019, UC Berkeley, "Understanding and engineering bio membranes for reconstitution of cellular functions"
6. Leibniz-Kolleg 2018, University of Potsdam, "What can we learn from model systems"
7. IRTG Colloquium 2017, Potsdam, "What proteins/surfaces/particles sticking to vesicles do to the membrane phase state and morphology"
8. Annual Meeting of the German Biophysical Society 2016, Erlangen, "Mechanical properties of giant vesicles isolated from the plasma membrane"