JINGHUI LIU

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Max Planck Institute for Physics of Complex Systems (PKS) & Cell Biology and Genetics (CBG), Dresden SN, Germany

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EDUCATION

Massachusetts Institute of Technology — Cambridge MA, US

Doctor of Philosophy in Physics — Sep. 2022

Thesis: "Topology, Symmetry and Mechanics: Deciphering and Controlling information flows in a living cell".

Supervisor: Prof. Nikta Fakhri. Advisors: Prof. Jörn Dunkel, Prof. Mehran Kardar and Prof. Iain W. Stewart.

Peking University — Beijing, China

Bachelor of Science in Physics — Jul. 2016

RESEARCH INTERESTS

Bioelectricity, regenerative biology, cell and tissue mechanics, optogenetics, topological defects, experimental/theoretical biophysics, soft condensed matter, complex systems.

RESEARCH EXPERIENCE

Max Planck Institute for Molecular Cell Biology and Genetics (MPI-CBG) — Dresden SN, DE

Marie Skłodowska-Curie Postdoctoral Fellow | European Commission — Sep., 2025 (expected start date)

Max Planck Institute for the Physics of Complex Systems (MPI-PKS) — Dresden SN, DE

ELBE Postdoctoral Fellow | Center for Systems Biology Dresden (CSBD) — Oct. 2022 – Aug., 2025 (expected end date)

Advisors: Prof. Frank Jülicher, Prof. Stephan Grill and Dr. Rita Mateus.

Department of Physics, Massachusetts Institute of Technology — Cambridge MA, US

Graduate Research Assistant (Prof. Nikta Fakhri) — Sep. – Dec., 2016, 2017 – 2022

G1 Rotation Intern (Prof. Leonid Mirny) Feb. – Jun., 2017 | Undergraduate Research Intern (Prof. Jeff Gore) Jul. – Sep., 2015

School of Physics, Peking University — Beijing, China

Undergraduate Research Assistant (Prof. Qi Ouyang) — 2014 – 2016

PUBLICATIONS (SELECTED)

*: Authors contributed equally to the publication †: Corresponding authors

1. **Jinghui Liu***, Elisa Nerli*, Charlie Duclut, Amit Singh Vishen, Naomi Berbée, Sylvia Kaufmann, Cesar Ponce, Aristides B Arrenberg, Frank Jülicher†, Rita Mateus†. Injury-induced electrochemical coupling triggers regenerative cell proliferation. Submitted. | bioRxiv

2. **Jinghui Liu***, Tom Bukart*, Alex Ziepke, John Reinhard, Yu-Chen Chao, Tzer Han Tan, S. Zachary Swartz, Erwin Frey†, Nikta Fakhri†. Light-induced cortical excitability reveals programmable shape dynamics in starfish oocytes. *Nature Physics* (2025). | Nat Phys

   -- Featured in: *Nature Physics Research Briefing* | *MIT News* | *Science Daily* | *Science Mag* | *PHYS.org*

3. Tina Wiegand*, **Jinghui Liu***, Lutz Vogeley, Isabel LuValle-Burke, Jan Geisler, Anatol W. Fritsch, Anthony A. Hyman†, Stephan W. Grill†. Actin polymerization counteracts prewetting of N-WASP on supported lipid bilayers. *Proceedings of the National Academy of Sciences*, 121,50 (2024). | PNAS

4. **Jinghui Liu**, Jan F. Totz, Pearson W. Miller, Alasdair D. Hastewell, Yu-Chen Chao, Jörn Dunkel†, Nikta Fakhri†. Topological braiding and virtual particles on the cell membrane. *Proceedings of the National Academy of Sciences*, 118,34 (2021). | PNAS

   -- Featured in: *American Mathematical Society (AMS) Math in the Media*

5. Tzer Han Tan*, **Jinghui Liu***, Pearson W. Miller*, Melis Tekant, Jörn Dunkel†, Nikta Fakhri†. Topological turbulence on the membrane of a living cell. *Nature Physics*, 1-6 (2020). | Nat Phys

   -- Featured in: *Cover Article* | *Nature Research Highlights* | *Physics World Frontier* | *PHYS.org*

PUBLICATIONS (FULL)

*: Authors contributed equally to the publication †: Corresponding authors

10. Alasdair D. Hastewell*, **Jinghui Liu***, Shreyas Gokhale*, Alexandru Bacanu, Lisa Lin, Jörn Dunkel†, Nikta Fakhri†. Nonlinear and non-Hermitian mechanics of living nonreciprocal solids. In preparation.
9. **Jinghui Liu***, Elisa Nerli*, Charlie Duclut, Amit Singh Vishen, Naomi Berbée, Sylvia Kaufmann, Cesar Ponce, Aristides B Arrenberg, Frank Jülicher†, Rita Mateus†. Injury-induced electrochemical coupling triggers regenerative cell proliferation. Submitted. | bioRxiv
8. Yu-Chen Chao*, Shreyas Gokhale*, Lisa Lin*, Alasdair D. Hastewell*, Alexandru Bacanu, Yuchao Chen, Junang Li, **Jinghui Liu**, HyunSeok Lee, Jörn Dunkel†, Nikta Fakhri†. Selective excitation of work-generating cycles in nonreciprocal solids. In revision. | arXiv
7. Peter J. Foster†, **Jinghui Liu**, Alexandra Zampetaki, Sebastian Fürthauer†, Nikta Fakhri†. Active mechanics of sea star oocytes. In revision. | bioRxiv (earlier version)
6. **Jinghui Liu***, Tom Bukart*, Alex Ziepke, John Reinhard, Yu-Chen Chao, Tzer Han Tan, S. Zachary Swartz, Erwin Frey†, Nikta Fakhri†. Light-induced cortical excitability reveals programmable shape dynamics in starfish oocytes. *Nature Physics* (2025). | Nat Phys
5. Tina Wiegand*, **Jinghui Liu***, Lutz Vogeley, Isabel LuValle-Burke, Jan Geisler, Anatol W. Fritsch, Anthony A. Hyman†, Stephan W. Grill†. Actin polymerization counteracts prewetting of N-WASP on supported lipid bilayers. *Proceedings of the National Academy of Sciences*, 121,50 (2024). | PNAS
4. **Jinghui Liu**, Jan F. Totz, Pearson W. Miller, Alasdair D. Hastewell, Yu-Chen Chao, Jörn Dunkel†, Nikta Fakhri†. Topological braiding and virtual particles on the cell membrane. *Proceedings of the National Academy of Sciences*, 118,34 (2021). | PNAS
3. Manon C. Wigbers*, Tzer Han Tan*, Fridtjof Brauns, **Jinghui Liu**, S. Zachary Swartz, Erwin Frey†, Nikta Fakhri†. A hierarchy of protein patterns robustly decodes cell shape information. *Nature Physics*, 1-7 (2021). | Nat Phys
2. Tzer Han Tan*, **Jinghui Liu***, Pearson W. Miller*, Melis Tekant, Jörn Dunkel†, Nikta Fakhri†. Topological turbulence on the membrane of a living cell. *Nature Physics*, 1-6 (2020). | Nat Phys
1. Tim A. Hoek, Kevin Axelrod, Tommaso Biancalani, Eugene A. Yurtsev, **Jinghui Liu**, Jeff Gore†. Resource availability modulates the cooperative and competitive nature of a microbial cross-feeding mutualism[J]. *PLoS biology*, 14,8 (2016). | PLoS Biol

AWARDS AND HONORS

MPI-CBG, Horizon Europe, **Marie Skłodowska-Curie Actions (MSCA) Postdoctoral Fellowship**	2023
MPI-PKS, Center for Systems Biology Dresden, **ELBE Postdoctoral Fellowship**	2022
Santa Fe Institute, **SFI Complexity Postdoctoral Fellowship** *(gratefully declined)*	2022
DWI-Leibniz Institute, **Women Interactive Materials Award**	2021
MIT, School of Science, **MathWorks Science Fellowship**	2021 – 2022
UChicago Materials Research Center, **Rising Star Award in Soft and Biological Matter**	2020
MIT, Annual Biophysics Retreat, **Grand Poster Prize**	2019
MIT, Department of Physics, **Morton E. Goulder Presidential Fellowship**	2016 – 2017
Peking University, School of Life Sciences, **Undergraduate Research Honor Program Scholarship**	2015
Peking University, **Hui-Chun Chin & Tsung-Dao Lee Chinese Undergraduate Research Endowment**	2014 – 2015
Peking University, School of Physics, **Wusi Scholarship**	2014 – 2015

GRANT WRITING

Funded:

2023, Horizon Europe, Marie Skłodowska-Curie Actions Postdoctoral Fellowship (LIF; Life Science)

- Electrical signaling and growth control in zebrafish fin regeneration (€173847.36; PI: **Jinghui Liu**)
- Evaluation score: **99.20%** (Excellence 5.00/5.00; Impact 5.00/5.00; Implementation 4.80/5.00)

Submitted:

2021, James S. McDonnell Foundation, Understanding Dynamic and Multi-scale Systems Postdoctoral Fellowship

- Unravelling complexity of neural circuits through topological study of a visual perception system (PI: Jinghui Liu)

INVITED TALKS

Electrical signaling and growth control across organisms, *2025 Berkeley Future in Physics Workshop*, *Berkeley* 2025
Topological defects and information flows on the membrane of a living cell, *CMT Kids' Seminar*, *Harvard* 2021

CONTRIBUTED TALKS

Injury-induced electrochemical coupling in zebrafish, *Theory and Concepts in Biology, EMBL Heidelberg* 2025
Electrical signaling and growth control in zebrafish fin regeneration, *Annual Biophysics Retreat, MPI-PKS* 2025
Fast electrical effects in zebrafish fin regeneration, *Physical Biology Circle Meeting* 2024
Electrical signaling and growth control in zebrafish fin regeneration, *MPI-CBG Internal Seminar* 2023
High resolution mapping of odd fluctuations and oscillations in living chiral crystals, *DPG Spring Meeting* 2023
Light-induced cortical excitability reveals programmable shape dynamics in starfish oocytes, *APS March Meeting* 2023
Tuning cell division machinery in oocytes using light, *APS March Meeting* 2022
Topological braiding and virtual particles in the cell membrane, *WOST-women Virtual Talk Series* 2022
Topological defects and information flows on the membrane of a living cell, *Santa Fe Institute* 2022
Topological defects and information flows on the membrane of a living cell, *CSBD, MPI-PKS and MPI-CBG* 2021
Topological defects and information flows on the membrane of a living cell, *CPBF, Princeton University* 2021
Topological defects and information flows on the membrane of a living cell, *WIMA Award, DWI-Leibniz Institute* 2021
Topological braiding and bosonic phases on the cell membrane, *APS March Meeting* 2021
Topological braids, loops and bosonic phases on the cell membrane, *MSERC Award Session, UChicago* 2020
Vortices, space-time braids and loops in the membrane of a living cell, *Lunch Talk Series, MIT Physics* 2020
Vortices, space-time braids and loops in the membrane of a living cell, *GSNP Award Session, APS March Meeting* 2020
Topological turbulence in the membrane of a living cell, *Turbulence across Vast Scales, Flatiron Institute* [video] 2019
Topological turbulence in the membrane of a living cell, *GRS on Soft Condensed Matter Physics* 2019
Topological turbulence in the membrane of a living cell, *Theory of Living Systems Meeting, Boston University* [video] 2019
Direct observation of topological turbulence in the oocyte membrane, *APS March Meeting* 2019
Direct observation of topological turbulence in a biological system, *Annual Biophysics Retreat, MIT* 2018
Tuning the mechanochemical machinery in oocytes using light, *APS March Meeting* 2018

REFEREED POSTERS

Injury-induced electrochemical coupling in organismal regeneration, *Scientific Advisory Board Meeting, MPI-PKS* 2025
Decomposing odd vibrations in living chiral crystals, *GRC on Soft Condensed Matter Physics* 2023
Electrical signaling in zebrafish fin regeneration, *EMBO Workshop for Physics of Living Systems* 2023
Topological turbulence in the membrane of a living cell, *GRC on Soft Condensed Matter Physics* 2019
Bifurcation dynamics of a signaling network underlying EMT transition, *Annual URHP Retreat in Biology, PKU* 2015
Resource-dependent species diversity in a cross-feeding microbial community, *Annual Biophysics Retreat, MIT* 2015

TEACHING EXPERIENCE

Teaching Assistant:

2020 – 2021 Spring, Junior Lab in Experimental Physics, Department of Physics, MIT (Instructor: Prof. Philip Harris)
2019 – 2020 Spring, Introduction to Biological Physics, Department of Physics, MIT (Instructor: Prof. Jeff Gore)

COMMUNITY SERVICE

Dresden Science Night (#LNDWDD, Annual), On-site Exhibition Volunteer 2024
MPI-CBG, Advising Resources for individual Feedback on Interdisciplinary Talks (iFIT) 2023 – Present
MIT, Departmental Advising Resources for Easing Friction and Stress (Physics REFS) 2019 – 2021