Jinghui Liu, PhD

Marie Skłodowska-Curie Postdoctoral Fellow

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EDUCATION

Massachusetts Institute of Technology, Cambridge MA— *Ph.D. in Physics, Sep. 2022*

Thesis: *Topology, Symmetry and Mechanics: Information Flows in a Living Cell*

Advisor: Prof. Nikta Fakhri; Committee: Profs. Jörn Dunkel, Mehran Kardar, Iain Stewart.

Peking University, Beijing, China — *B.S. in Physics, Jul. 2016*

RESEARCH APPOINTMENTS

Marie Curie Postdoctoral Fellow, *Max Planck Institute of Molecular Cell Biology and Genetics*

Project: Electrical signaling and growth control in zebrafish fin regeneration.

Host Lab: Dr. Rita Mateus; Co-supervisor: Prof. Frank Jülicher. *Sep. 2025 – Sep. 2027 (expected)*

ELBE Postdoctoral Fellow, *Max Planck Institute for the Physics of Complex Systems*

Advisor: Prof. Frank Jülicher; Host Labs: Prof. Stephan Grill, Dr. Rita Mateus. *Oct. 2022 – Aug. 2025.*

SELECTED PUBLICATIONS

*(Equal contribution marked with *; corresponding authors marked with †)*

Liu J*, Nerli E*, Duclut C, Vishen A S, Berbée N, Kaufmann S, Ponce C, Arrenberg A B, Jülicher F†, Mateus R†. "Injury-induced electrochemical coupling triggers organ growth." *Science Advances* 12,eaec0687(2026). DOI: 10.1101/2025.04.03.647033.

Liu J*, Bukart T*, Ziepke A, Reinhard J, Chao Y, Tan T H, Swartz S Z, Frey E†, Fakhri N†. "Light-induced cortical excitability reveals programmable shape dynamics in starfish oocytes." *Nature Physics* (2025). DOI: 10.1038/s41567-025-02807-x.

– Featured in: Nature Physics Research Briefing; MIT News; Science Daily; Science Mag; PHYS.org

Wiegand T*, **Liu J***, Vogeley L, LuValle-Burke I, Geisler J, Fritsch A W, Hyman A A†, Grill S W†. "Actin polymerization counteracts prewetting of N-WASP on supported lipid bilayers." *Proceedings of the National Academy of Sciences*, 121,50 (2024). DOI: 10.1073/pnas.2407497121.

Liu J, Totz J F, Miller P W, Hastewell A D, Chao Y, Dunkel J†, Fakhri N†. "Topological braiding and virtual particles on the cell membrane." *Proceedings of the National Academy of Sciences*, 118,34 (2021). DOI: 10.1073/pnas.2104191118.

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

Tan T H*, **Liu J***, Miller P W*, Tekant M, Dunkel J†, Fakhri N†. "Topological turbulence on the membrane of a living cell." *Nature Physics*, 1-6 (2020). DOI: 10.1038/s41567-020-0841-9.

– Featured in: Cover Article; Nature Research Highlights; Physics World Frontier; PHYS.org

SELECTED AWARDS AND HONORS

Year	Award / Fellowship	Institution
2023	**MSCA Postdoctoral Fellowship (Score: 99.2/100)**	MPI-CBG & MPI-PKS
2022	**Complexity Postdoctoral Fellowship**	Santa Fe Institute *(gratefully declined)*
2021	**ELBE Postdoctoral Fellowship**	MPI-PKS & Center for Systems Biology Dresden
2021	**Women Interactive Materials Award**	DWI-Leibniz Institute
2021	**Mathworks Science Fellowship**	MIT School of Science
2020	**Rising Star in Soft and Biological Matter**	UChicago Materials Research Center
2019	**Grand Poster Prize**	MIT Biophysics Retreat
2016	**Morton E. Goulder Presidential Fellowship**	MIT Department of Physics
2014	**Chin & Tsung-Dao Lee Research Endowment**	Peking University

SELECTED TALKS AND PRESENTATIONS

Selected Talk, Biology for Physics, BPS Barcelona (2026)— "*Injury-induced electrochemical coupling triggers organ growth.*"

Invited Talk, Center for Interdisciplinary Studies Seminar, West Lake University (2026)— "*The role of electrical organizers in soft and growing living matter.*"

Invited Talk, Center for Quantitative Biology, Peking University (2026)— "*The role of electrical organizers in soft and growing living matter.*"

Selected Talk, Theory and Concepts in Biology, EMBL Heidelberg (2025)— "*The role of electrical signals in fast-tracking tissue regeneration.*"

Invited Talk, Future in Physics Workshop, University of California, Berkeley (2025)— "*Electrical signaling and growth control across organisms.*"

Invited Talk, Center for the Physics of Biological Function, Princeton University (2021)— "*Topological defects and information flows on the membrane of a living cell.*"

Invited Talk, CMT Kids' Seminar, Harvard University (2021)— "*Topological defects and information flows on the membrane of a living cell.*"

(Full list available upon request.)

TEACHING AND MENTORING

Teaching Assistant, MIT Physics Department

Introduction to Biological Physics (Spring 2020); *Junior Lab in Experimental Physics* (Spring 2021).

Mentoring Experience:

Year	Name	Enrollment	Research
2024	Cesar Ponce Diego	Master student, UNAM Chemistry	International Max Planck Research Schools Intern
2022	Lisa Lin	Ph.D. student, MIT Physics	G1 Rotation
2022	John Reinhard	Ph.D. student, UdS Medical Biochemistry	Woods Hole Physiology Post-course Research
2020	Yu-Chen Chao	Ph.D. student, Harvard Applied Physics	G1 Rotation
2019	Ariana Park	Undergraduate student, MIT Physics	Research Intern
2019	Hugh Higinbotham	Ph.D. student, MIT Physics	G1 Rotation
2018	Sebastian T. Coupe	Ph.D. student, MIT Biology	G1 Rotation

SERVICE AND OUTREACH

2024, Dresden Science Long Night, On-site Exhibition Volunteer

2023-present, MPI-CBG, Advising Resources for Individual Feedback on Interdisciplinary Talks

2019-2021, MIT, Departmental Advising Resources for Easing Friction and Stress

REFERENCES

(Primary contacts: ☆)

☆ Prof. Dr. **Nikta Fakhri**, Massachusetts Institute of Technology
Professor of Physics; fakhri@mit.edu; +1 617- 763-1127

☆ Prof. Dr. **Frank Jülicher**, Max Planck Institute for Physics of Complex Systems (MPI-PKS)
Director; julicher@pks.mpg.de; +49 351-871-1202; Biological Physics

☆ Prof. Dr. **Erwin Frey**, Ludwig-Maximilians-Universität München (LMU)
Chair for Statistical and Biological Physics; frey@lmu.de; +49 (0)89-2180-4538

Prof. Dr. **Stephan Grill**, Max Planck Institute of Molecular Cell Biology and Genetics (MPI-CBG)
Director; grill@mpi-cbg.de; +49 351-210-2300; Biological Physics

Dr. **Rita Mateus**, Max Planck Institute of Molecular Cell Biology and Genetics (MPI-CBG) & TU-Dresden

Group Leader; mateus@mpi-cbg.de; +49 351-210-2504; Developmental Biology

Prof. Dr. **Jörn Dunkel**, Massachusetts Institute of Technology
Professor of Mathematics; dunkel@mit.edu; +1 617-253-7826

FULL PUBLICATION LIST

*Key publications: ☆ ; Equal contribution: * ; Corresponding author: †.*

Published

10. Foster P J†, Zampetaki A, **Liu J**, Fürthauer S†, Fakhri N†. "Active mechanics of sea star oocytes." *bioRxiv*. In Review. DOI: 10.1101/2022.04.22.489189.

☆ 9. **Liu J***, Nerli E*, Duclut C, Vishen A S, Berbée N, Kaufmann S, Ponce C, Arrenberg A B, Jülicher F†, Mateus R†. "Injury-induced electrochemical coupling triggers organ growth." *Science Advances* 12,eaec0687(2026). DOI: 10.1101/2025.04.03.647033.

– Featured in: BioArt; TU Dresden News; Sachsen News

8. Chao Y-C*, Gokhale S*, Lin L*, Hastewell A D*, Bacanu A, Chen Y, Li J, **Liu J**, Lee H, Dunkel J, Fakhri N†. "Selective excitation of work-generating cycles in nonreciprocal solids". *Nature Physics* 22, 474-482 (2026). DOI: 10.1038/s41567-026-03178-7.

☆ 7. **Liu J**, Bukart T. "Optical control of an excitable enzyme circuit for engineering dynamic cell shapes." *Nature Physics* 21, 706-707 (2025). DOI: 10.1038/s41567-025-02810-2.

☆ 6. **Liu J***, Bukart T*, Ziepke A, Reinhard J, Chao Y, Tan T H, Swartz S Z, Frey E†, Fakhri N†. "Light-induced cortical excitability reveals programmable shape dynamics in starfish oocytes." *Nature Physics* 21, 846-855 (2025). DOI: 10.1038/s41567-025-02807-x.

– Featured in: Nature Physics Research Briefing; MIT News; Science Daily; Science Mag; PHYS.org

5. Wiegand T*, **Liu J***, Vogeley L, LuValle-Burke I, Geisler J, Fritsch A W, Hyman A A†, Grill S W†. "Actin polymerization counteracts prewetting of N-WASP on supported lipid bilayers." *Proceedings of the National Academy of Sciences*, 121,50 (2024). DOI: 10.1073/pnas.2407497121.

☆ 4. **Liu J**, Totz J F, Miller P W, Hastewell A D, Chao Y, Dunkel J†, Fakhri N†. "Topological braiding and virtual particles on the cell membrane." *Proceedings of the National Academy of Sciences*, 118,34 (2021). DOI: 10.1073/pnas.2104191118.

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

3. Wigbers M C*, Tan T H*, Brauns F, **Liu J**, Swartz S Z, Frey E†, Fakhri N†. "A hierarchy of protein patterns robustly decodes cell shape information." *Nature Physics* (2021). DOI: 10.1038/s41567-021-01164-9.

☆ 2. Tan T H*, **Liu J***, Miller P W*, Tekant M, Dunkel J†, Fakhri N†. "Topological turbulence on the membrane of a living cell." *Nature Physics*, 1-6 (2020). DOI: 10.1038/s41567-020-0841-9.

– Featured in: Cover Article; Nature Research Highlights; Physics World Frontier; PHYS.org

1. Hoek T A, Axelrod K, Biancalani T, Yurtsev E A, **Liu J**, Gore J†. "Resource availability modulates the cooperative and competitive nature of a microbial cross-feeding mutualism". *PLoS biology* (2016). DOI: 10.1371/journal.pbio.1002540.